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(54) SYSTEM FOR FACILITATING A TRANSACTION

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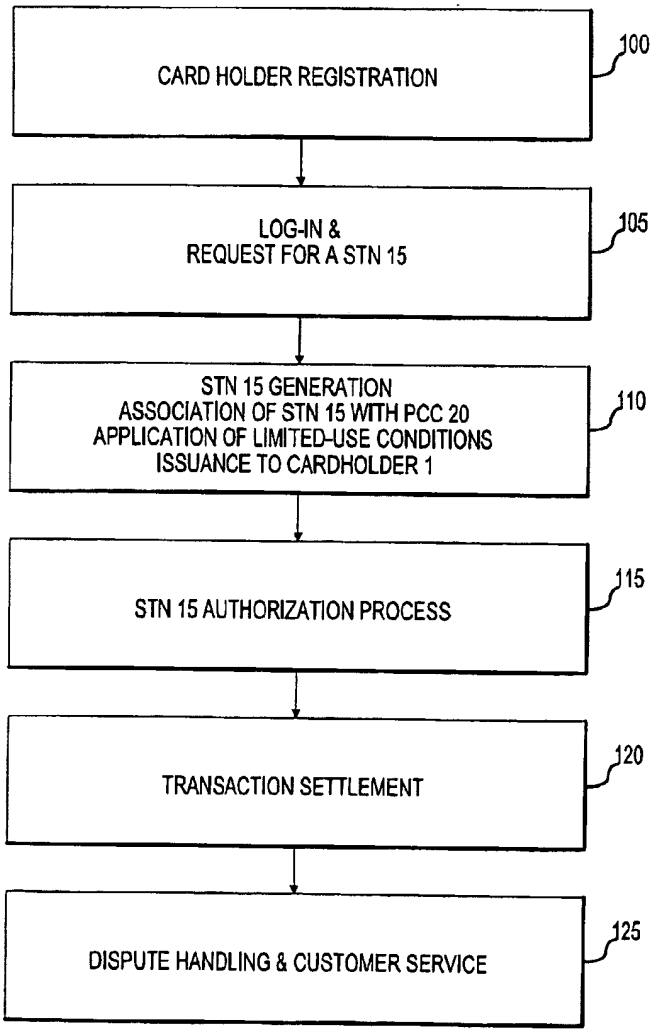
(57) ABSTRACT

The present invention provides a system and method for facilitating a transaction using a secondary transaction number that is associated with a cardholder's primary account. The cardholder provides the secondary transaction number, often with limited-use conditions associated therewith, to a merchant to facilitate a more secure and confident transaction.



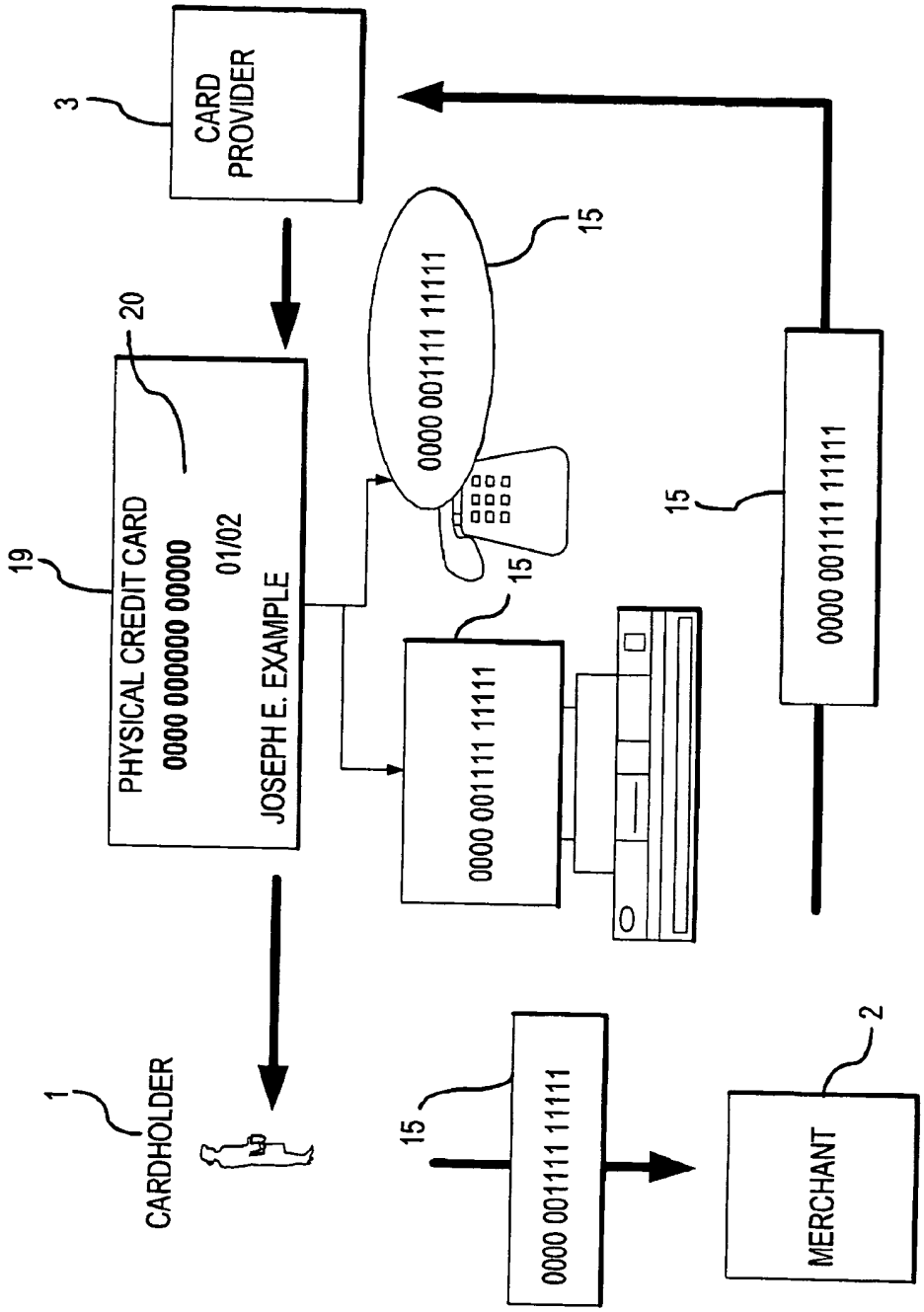

3
CARD PROVIDER
15
0000 001111 11111
20
19
PHYSICAL CREDIT CARD
0000 000000 00000
01/02
JOSEPH E. EXAMPLE
15
0000 001111 11111
15
0000 001111 11111
1
CARDHOLDER
15
0000 001111 11111
2
MERCHANT

FIG.1

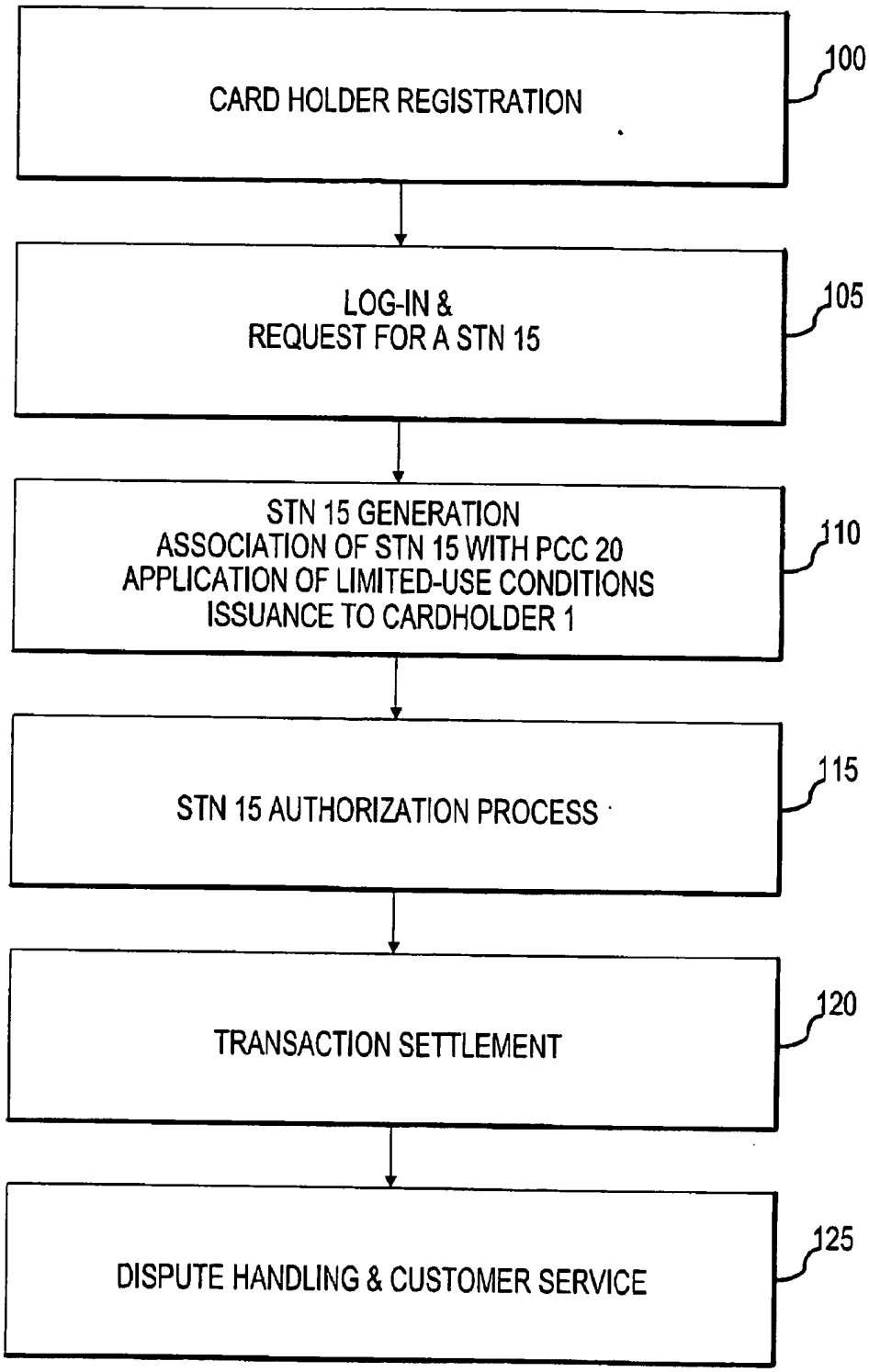

CARD HOLDER REGISTRATION
100
LOG-IN &
REQUEST FOR A STN 15
105
STN 15 GENERATION
ASSOCIATION OF STN 15 WITH PCC 20
APPLICATION OF LIMITED-USE CONDITIONS
ISSUANCE TO CARDHOLDER 1
110
STN 15 AUTHORIZATION PROCESS
115
TRANSACTION SETTLEMENT
120
DISPUTE HANDLING & CUSTOMER SERVICE
125

FIG. 2

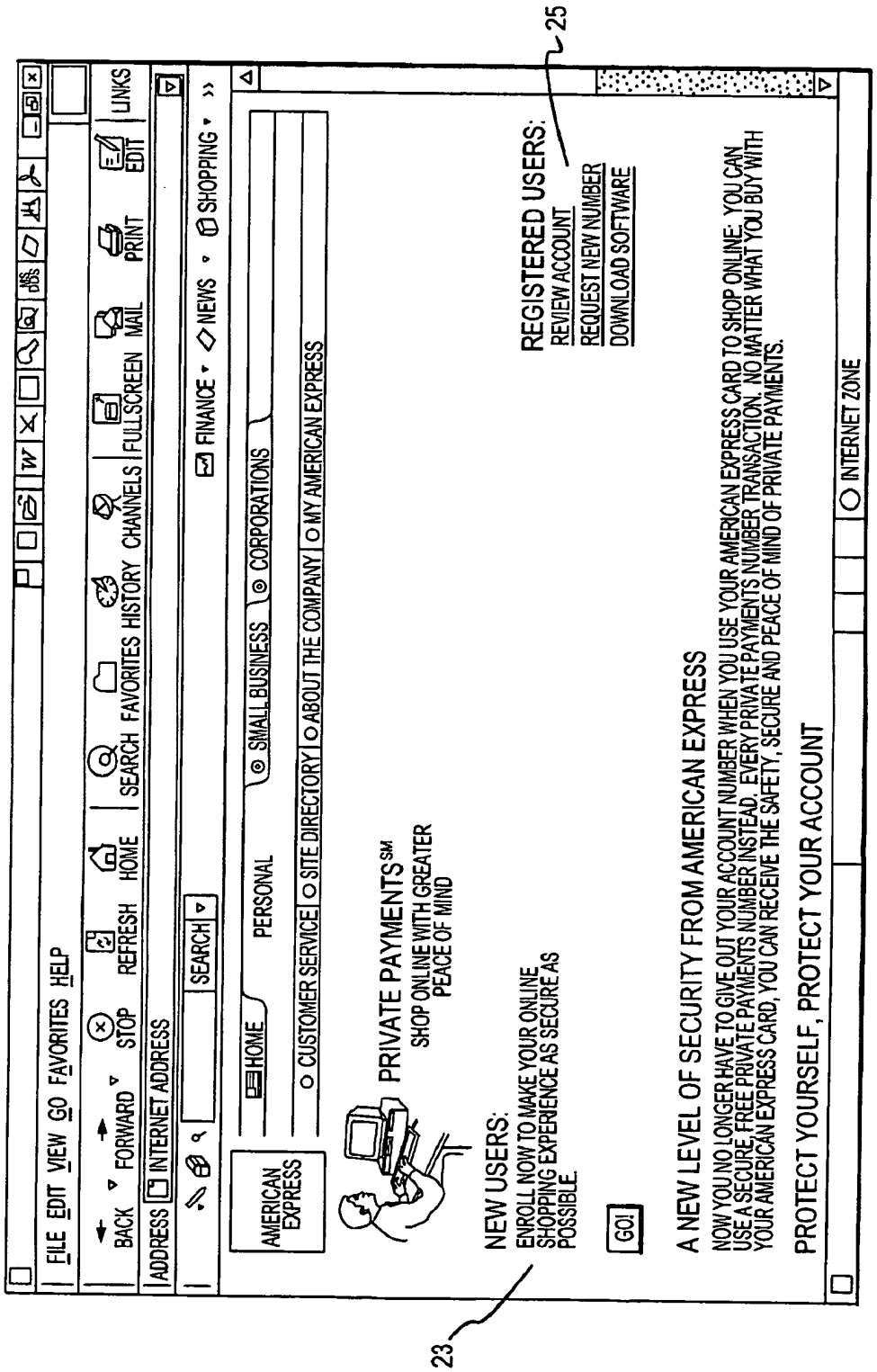

25
23
FILE EDIT VIEW GO FAVORITES HELP
BACK FORWARD STOP REFRESH HOME SEARCH FAVORITES HISTORY CHANNELS FULLSCREEN MAIL PRINT EDIT LINKS
ADDRESS INTERNET ADDRESS
SEARCH
FINANCE NEWS SHOPPING
AMERICAN EXPRESS
HOME
PERSONAL
SMALL BUSINESS
CORPORATIONS
CUSTOMER SERVICE
SITE DIRECTORY
ABOUT THE COMPANY
MY AMERICAN EXPRESS
PRIVATE PAYMENTS℠
SHOP ONLINE WITH GREATER PEACE OF MIND
NEW USERS:
ENROLL NOW TO MAKE YOUR ONLINE SHOPPING EXPERIENCE AS SECURE AS POSSIBLE.
GO!
REGISTERED USERS:
REVIEW ACCOUNT
REQUEST NEW NUMBER
DOWNLOAD SOFTWARE
A NEW LEVEL OF SECURITY FROM AMERICAN EXPRESS
NOW YOU NO LONGER HAVE TO GIVE OUT YOUR ACCOUNT NUMBER WHEN YOU USE YOUR AMERICAN EXPRESS CARD TO SHOP ONLINE. YOU CAN USE A SECURE, FREE PRIVATE PAYMENTS NUMBER INSTEAD. EVERY PRIVATE PAYMENTS NUMBER TRANSACTION. NO MATTER WHAT YOU BUY WITH YOUR AMERICAN EXPRESS CARD, YOU CAN RECEIVE THE SAFETY, SECURE AND PEACE OF MIND OF PRIVATE PAYMENTS.
PROTECT YOURSELF, PROTECT YOUR ACCOUNT
INTERNET ZONE

FIG.3

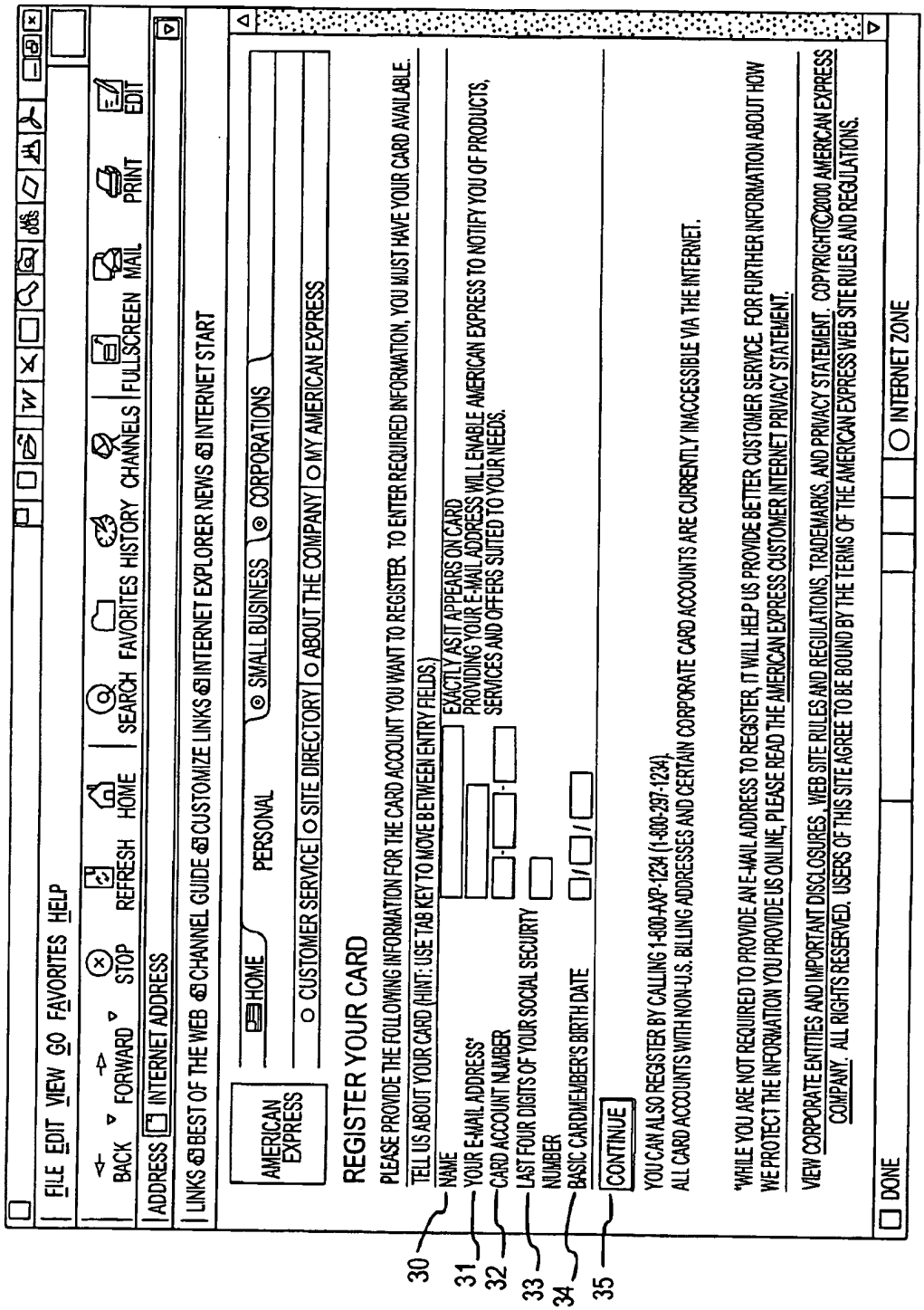

FILE EDIT VIEW GO FAVORITES HELP
BACK FORWARD STOP REFRESH HOME SEARCH FAVORITES HISTORY CHANNELS FULLSCREEN MAIL PRINT EDIT
ADDRESS INTERNET ADDRESS
LINKS BEST OF THE WEB CHANNEL GUIDE CUSTOMIZE LINKS INTERNET EXPLORER NEWS INTERNET START
AMERICAN EXPRESS
HOME
PERSONAL
SMALL BUSINESS
CORPORATIONS
CUSTOMER SERVICE
SITE DIRECTORY
ABOUT THE COMPANY
MY AMERICAN EXPRESS
REGISTER YOUR CARD
PLEASE PROVIDE THE FOLLOWING INFORMATION FOR THE CARD ACCOUNT YOU WANT TO REGISTER. TO ENTER REQUIRED INFORMATION, YOU MUST HAVE YOUR CARD AVAILABLE.
TELL US ABOUT YOUR CARD (HINT: USE TAB KEY TO MOVE BETWEEN ENTRY FIELDS.)
NAME
EXACTLY AS IT APPEARS ON CARD
YOUR E-MAIL ADDRESS*
PROVIDING YOUR E-MAIL ADDRESS WILL ENABLE AMERICAN EXPRESS TO NOTIFY YOU OF PRODUCTS, SERVICES AND OFFERS SUITED TO YOUR NEEDS.
CARD ACCOUNT NUMBER
LAST FOUR DIGITS OF YOUR SOCIAL SECURITY NUMBER
BASIC CARDMEMBER'S BIRTH DATE
CONTINUE
YOU CAN ALSO REGISTER BY CALLING 1-800-AXP-1234 (1-800-297-1234).
ALL CARD ACCOUNTS WITH NON-U.S. BILLING ADDRESSES AND CERTAIN CORPORATE CARD ACCOUNTS ARE CURRENTLY INACCESSIBLE VIA THE INTERNET.
*WHILE YOU ARE NOT REQUIRED TO PROVIDE AN E-MAIL ADDRESS TO REGISTER, IT WILL HELP US PROVIDE BETTER CUSTOMER SERVICE. FOR FURTHER INFORMATION ABOUT HOW WE PROTECT THE INFORMATION YOU PROVIDE US ONLINE, PLEASE READ THE AMERICAN EXPRESS CUSTOMER INTERNET PRIVACY STATEMENT.
VIEW CORPORATE ENTITIES AND IMPORTANT DISCLOSURES. WEB SITE RULES AND REGULATIONS, TRADEMARKS, AND PRIVACY STATEMENT. COPYRIGHT©2000 AMERICAN EXPRESS COMPANY. ALL RIGHTS RESERVED. USERS OF THIS SITE AGREE TO BE BOUND BY THE TERMS OF THE AMERICAN EXPRESS WEB SITE RULES AND REGULATIONS.
DONE
INTERNET ZONE
30
31
32
33
34
35

FIG. 4

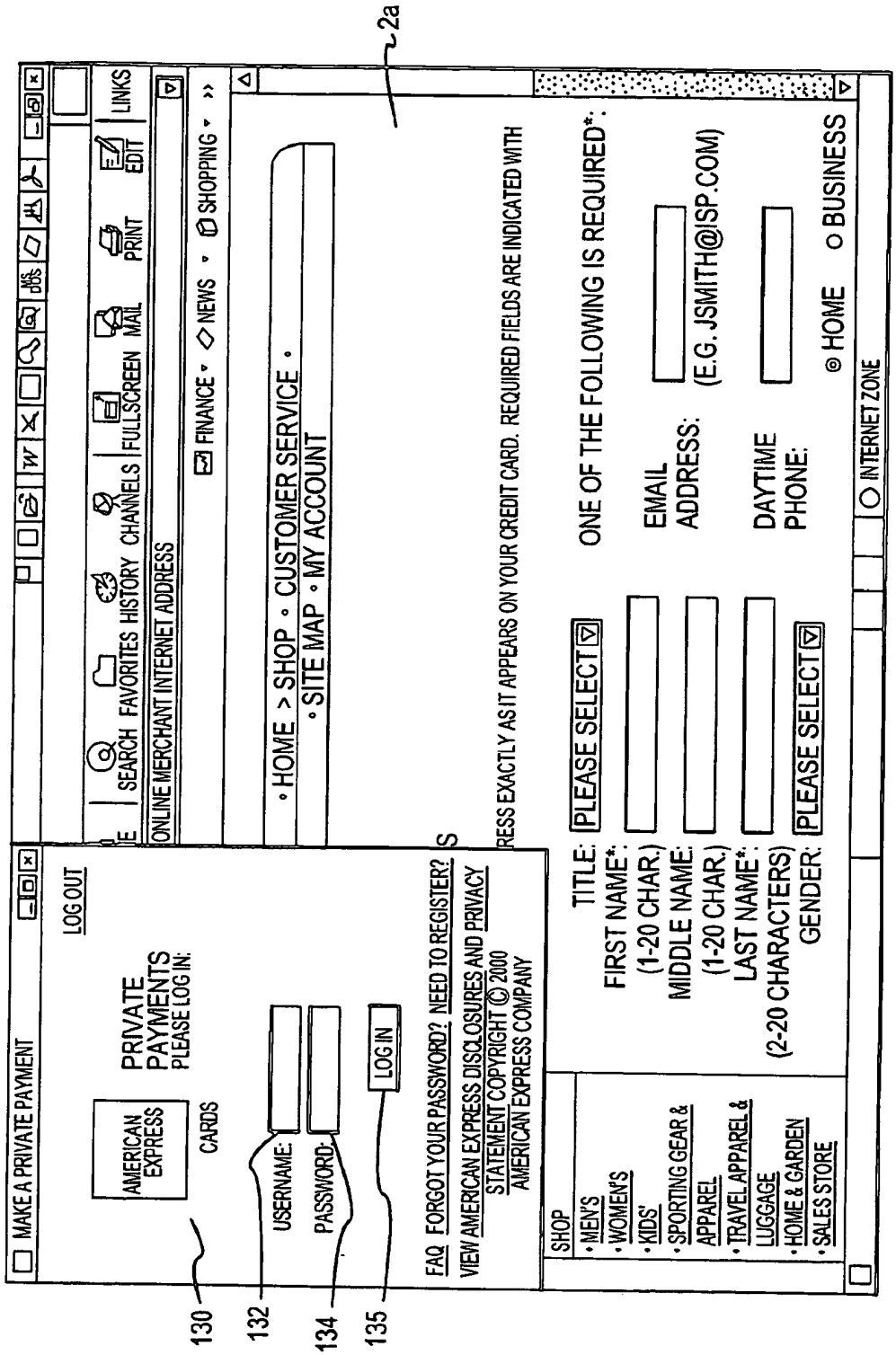

2a
MAKE A PRIVATE PAYMENT
LOG OUT
PRIVATE PAYMENTS
PLEASE LOG IN:
AMERICAN EXPRESS CARDS
USERNAME:
PASSWORD:
LOG IN
FAQ FORGOT YOUR PASSWORD? NEED TO REGISTER?
VIEW AMERICAN EXPRESS DISCLOSURES AND PRIVACY STATEMENT COPYRIGHT © 2000 AMERICAN EXPRESS COMPANY
SHOP
• MEN'S
• WOMEN'S
• KIDS'
• SPORTING GEAR & APPAREL
• TRAVEL APPAREL & LUGGAGE
• HOME & GARDEN
• SALES STORE
SEARCH FAVORITES HISTORY CHANNELS FULLSCREEN MAIL PRINT EDIT LINKS
ONLINE MERCHANT INTERNET ADDRESS
FINANCE NEWS SHOPPING
• HOME > SHOP • CUSTOMER SERVICE •
• SITE MAP • MY ACCOUNT
RESS EXACTLY AS IT APPEARS ON YOUR CREDIT CARD. REQUIRED FIELDS ARE INDICATED WITH
ONE OF THE FOLLOWING IS REQUIRED*:
TITLE: PLEASE SELECT
FIRST NAME*: (1-20 CHAR.)
MIDDLE NAME: (1-20 CHAR.)
LAST NAME*: (2-20 CHARACTERS)
GENDER: PLEASE SELECT
EMAIL ADDRESS: (E.G. JSMITH@ISP.COM)
DAYTIME PHONE:
HOME BUSINESS
INTERNET ZONE
130
132
134
135

FIG.5

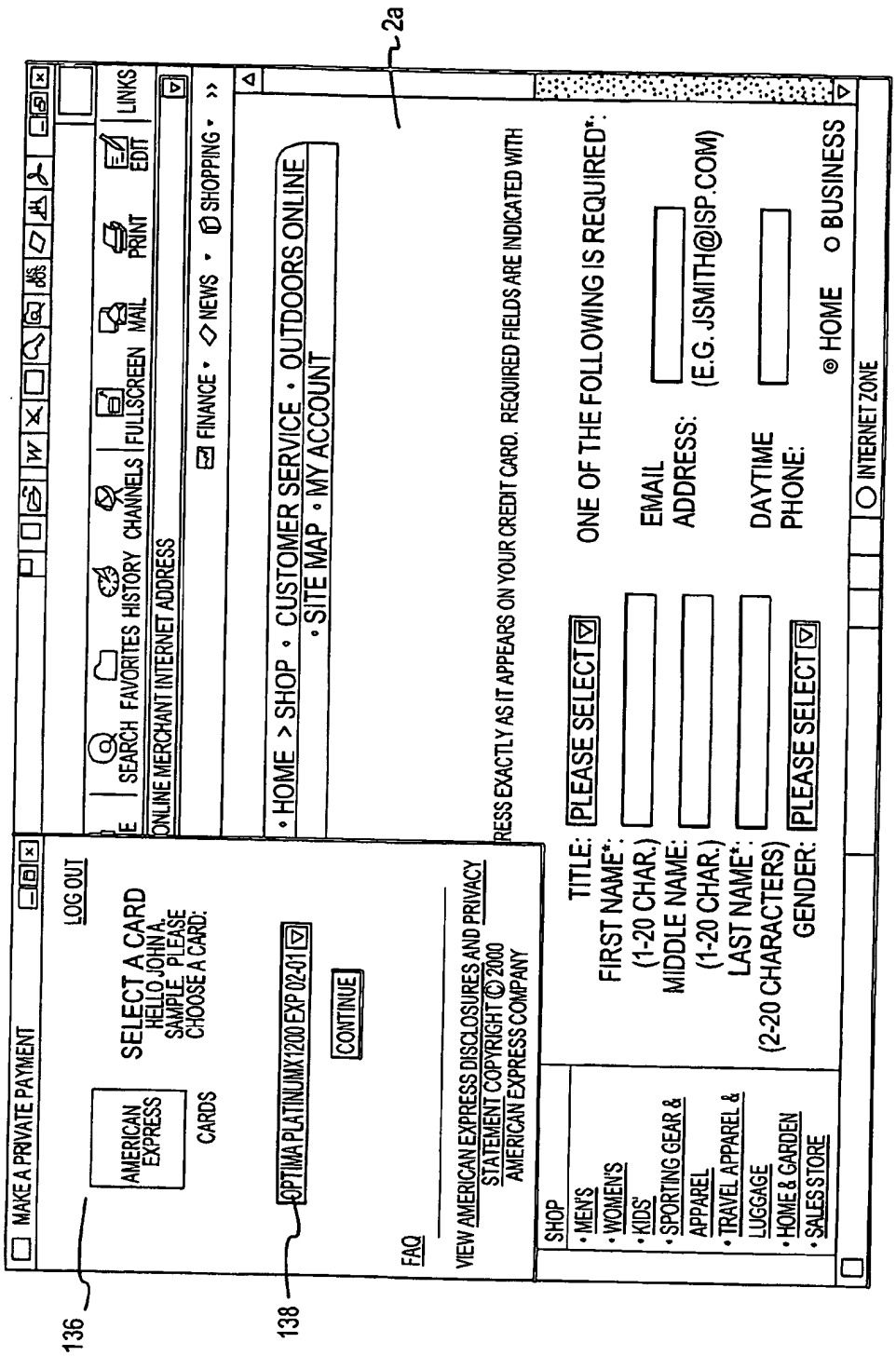

2a
136
138
MAKE A PRIVATE PAYMENT
LOG OUT
AMERICAN EXPRESS CARDS
SELECT A CARD
HELLO JOHN A.
SAMPLE PLEASE CHOOSE A CARD:
OPTIMA PLATINUMX1200 EXP 02-01
CONTINUE
FAQ
VIEW AMERICAN EXPRESS DISCLOSURES AND PRIVACY STATEMENT COPYRIGHT © 2000 AMERICAN EXPRESS COMPANY
SHOP
• MEN'S
• WOMEN'S
• KIDS'
• SPORTING GEAR & APPAREL
• TRAVEL APPAREL & LUGGAGE
• HOME & GARDEN
• SALES STORE
SEARCH FAVORITES HISTORY CHANNELS FULLSCREEN MAIL PRINT EDIT LINKS
ONLINE MERCHANT INTERNET ADDRESS
FINANCE • NEWS • SHOPPING • »
• HOME > SHOP • CUSTOMER SERVICE • OUTDOORS ONLINE
• SITE MAP • MY ACCOUNT
RESS EXACTLY AS IT APPEARS ON YOUR CREDIT CARD. REQUIRED FIELDS ARE INDICATED WITH
ONE OF THE FOLLOWING IS REQUIRED*:
TITLE: PLEASE SELECT
FIRST NAME*: (1-20 CHAR.)
MIDDLE NAME: (1-20 CHAR.)
LAST NAME*: (2-20 CHARACTERS)
GENDER: PLEASE SELECT
EMAIL ADDRESS: (E.G. JSMITH@ISP.COM)
DAYTIME PHONE:
◉ HOME ○ BUSINESS
INTERNET ZONE

FIG.6

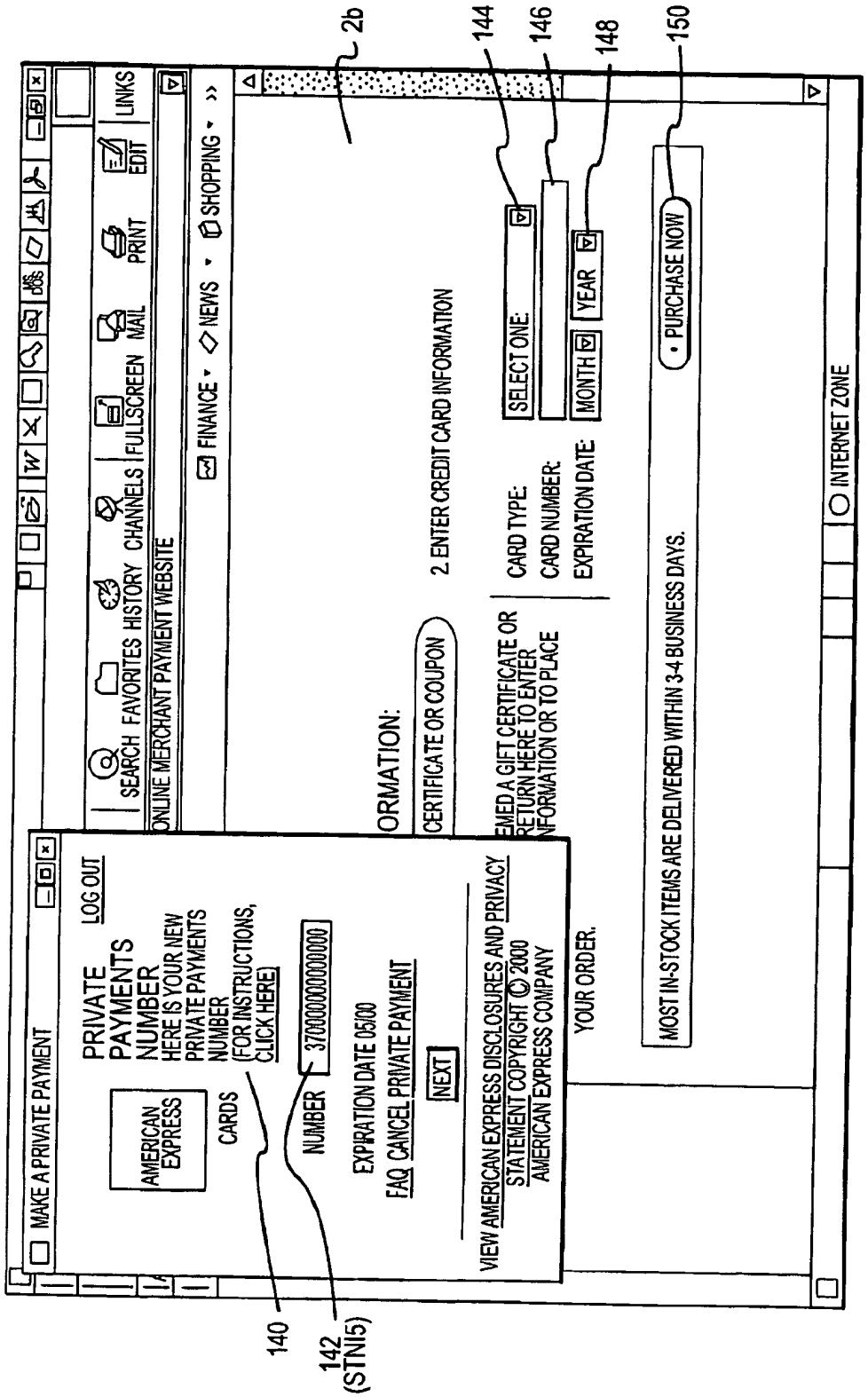

MAKE A PRIVATE PAYMENT
LOG OUT
PRIVATE PAYMENTS NUMBER
HERE IS YOUR NEW PRIVATE PAYMENTS NUMBER
(FOR INSTRUCTIONS, CLICK HERE)
AMERICAN EXPRESS CARDS
NUMBER 3700000000000
EXPIRATION DATE 05/00
FAQ CANCEL PRIVATE PAYMENT
NEXT
VIEW AMERICAN EXPRESS DISCLOSURES AND PRIVACY STATEMENT COPYRIGHT © 2000 AMERICAN EXPRESS COMPANY
ONLINE MERCHANT PAYMENT WEBSITE
SEARCH FAVORITES HISTORY CHANNELS FULLSCREEN MAIL PRINT EDIT LINKS
FINANCE NEWS SHOPPING
ORMATION:
CERTIFICATE OR COUPON
EMED A GIFT CERTIFICATE OR RETURN HERE TO ENTER NFORMATION OR TO PLACE
2. ENTER CREDIT CARD INFORMATION
CARD TYPE:
CARD NUMBER:
EXPIRATION DATE:
SELECT ONE:
MONTH
YEAR
YOUR ORDER.
MOST IN-STOCK ITEMS ARE DELIVERED WITHIN 3-4 BUSINESS DAYS.
PURCHASE NOW
INTERNET ZONE
140
142 (STN15)
2b
144
146
148
150

FIG.7

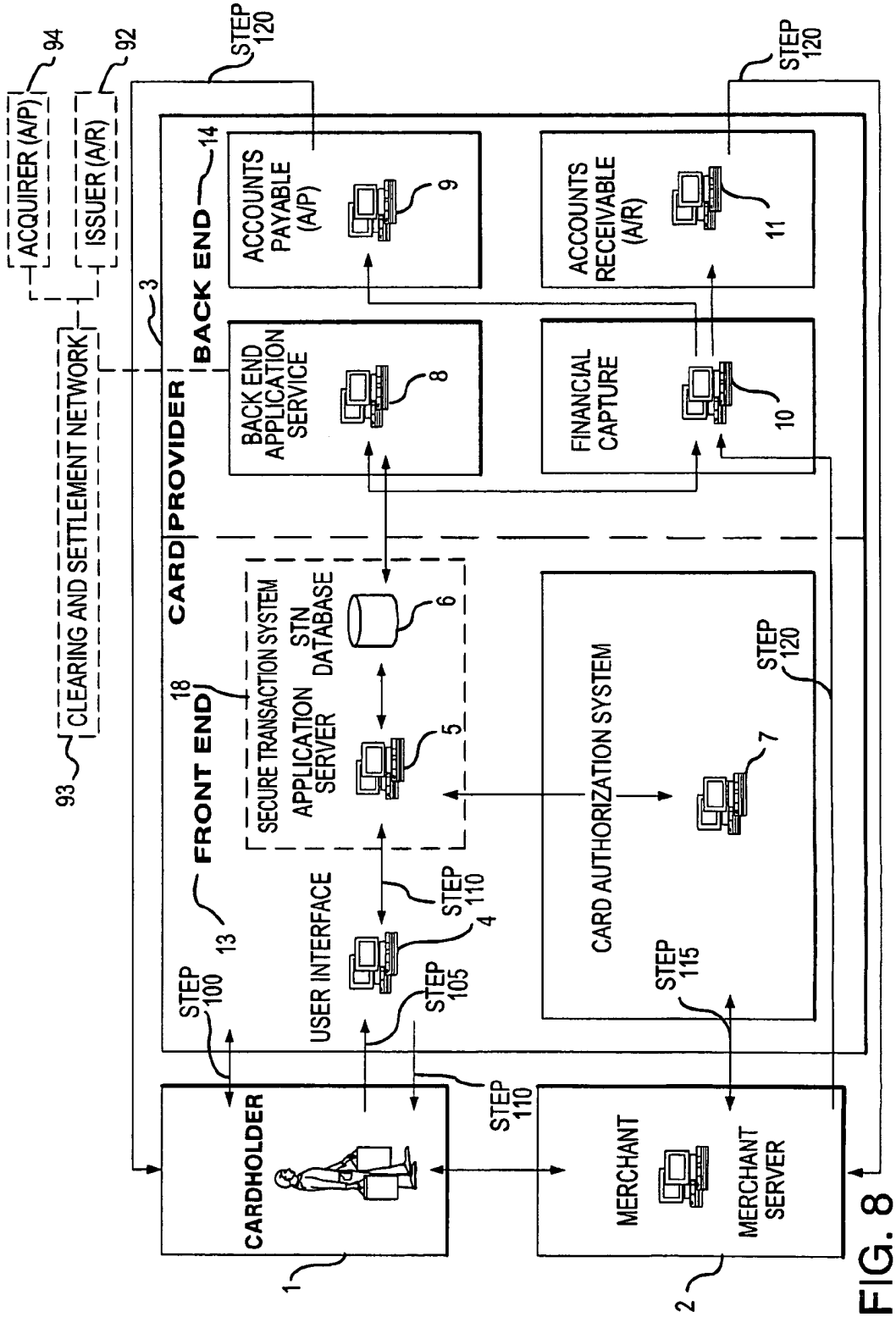

ACQUIRER (A/P)
94
ISSUER (A/R)
92
STEP 120
STEP 120
CLEARING AND SETTLEMENT NETWORK
93
3
CARD PROVIDER
BACK END
14
ACCOUNTS PAYABLE (A/P)
9
ACCOUNTS RECEIVABLE (A/R)
11
BACK END APPLICATION SERVICE
8
FINANCIAL CAPTURE
10
FRONT END
18
SECURE TRANSACTION SYSTEM
APPLICATION SERVER
STN DATABASE
6
5
13
USER INTERFACE
STEP 110
4
STEP 100
STEP 105
CARD AUTHORIZATION SYSTEM
7
STEP 120
STEP 115
STEP 110
CARDHOLDER
1
MERCHANT
MERCHANT SERVER
2

FIG. 8

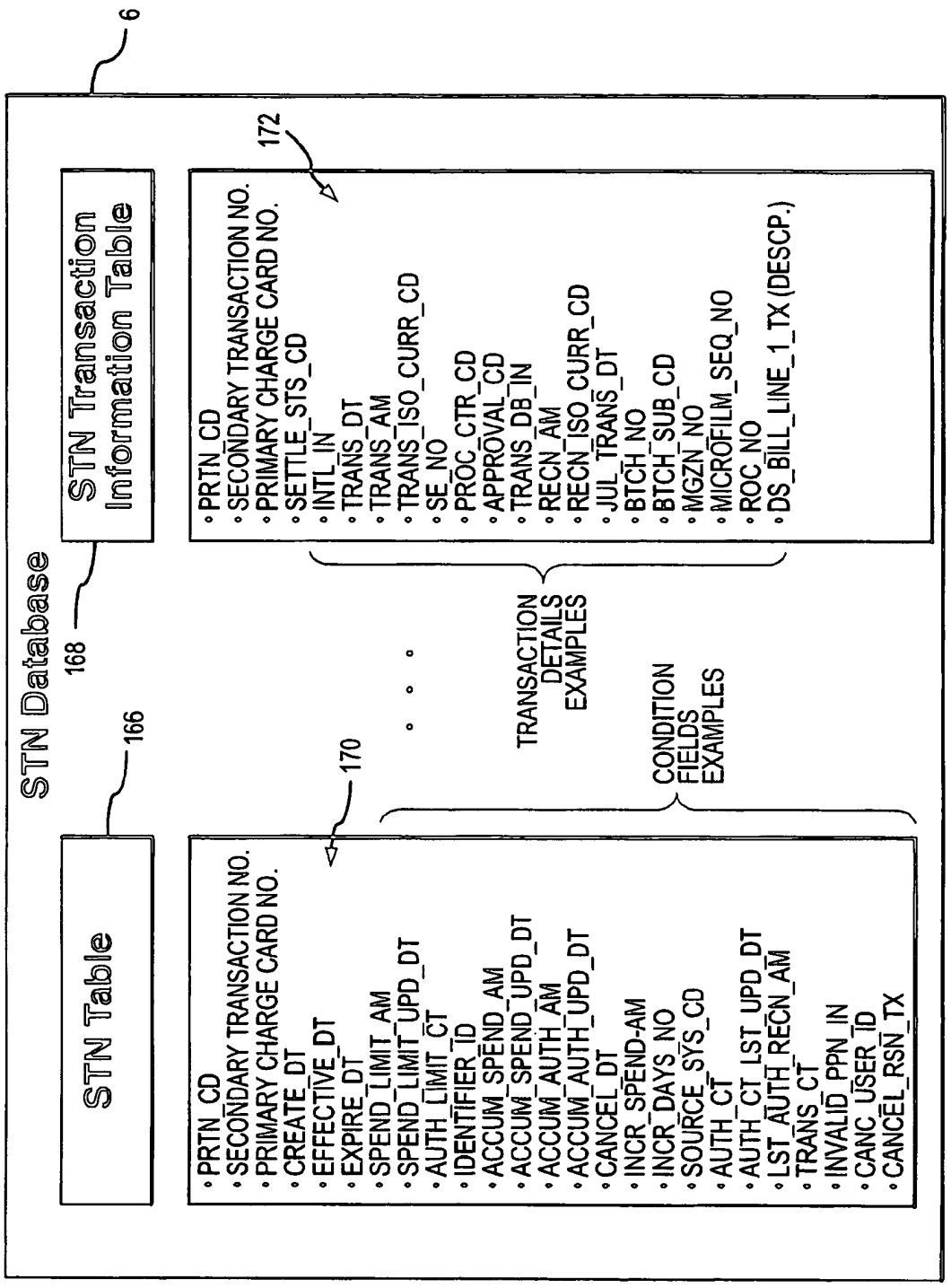

6
STN Database
STN Transaction Information Table
168
172
• PRTN_CD
• SECONDARY TRANSACTION NO.
• PRIMARY CHARGE CARD NO.
• SETTLE_STS_CD
• INTL_IN
• TRANS_DT
• TRANS_AM
• TRANS_ISO_CURR_CD
• SE_NO
• PROC_CTR_CD
• APPROVAL_CD
• TRANS_DB_IN
• RECN_AM
• RECN_ISO_CURR_CD
• JUL_TRANS_DT
• BTCH_NO
• BTCH_SUB_CD
• MGZN_NO
• MICROFILM_SEQ_NO
• ROC_NO
• DS_BILL_LINE_1_TX (DESCP.)
TRANSACTION DETAILS EXAMPLES
CONDITION FIELDS EXAMPLES
166
170
STN Table
• PRTN_CD
• SECONDARY TRANSACTION NO.
• PRIMARY CHARGE CARD NO.
• CREATE_DT
• EFFECTIVE_DT
• EXPIRE_DT
• SPEND_LIMIT_AM
• SPEND_LIMIT_UPD_DT
• AUTH_LIMIT_CT
• IDENTIFIER_ID
• ACCUM_SPEND_AM
• ACCUM_SPEND_UPD_DT
• ACCUM_AUTH_AM
• ACCUM_AUTH_UPD_DT
• CANCEL_DT
• INCR_SPEND-AM
• INCR_DAYS_NO
• SOURCE_SYS_CD
• AUTH_CT
• AUTH_CT_LST_UPD_DT
• LST_AUTH_RECN_AM
• TRANS_CT
• INVALID_PPN_IN
• CANC_USER_ID
• CANCEL_RSN_TX

FIG. 9

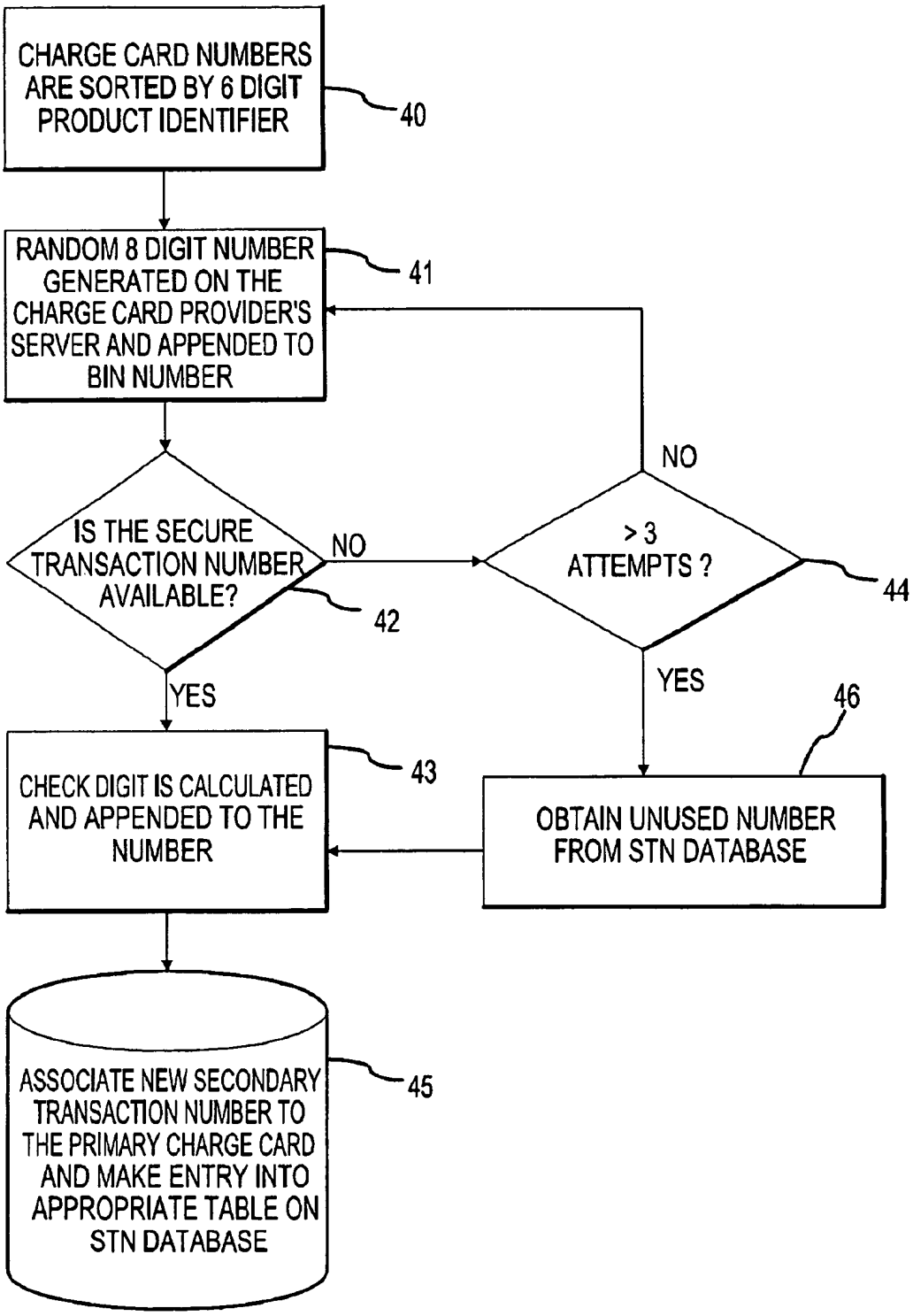

CHARGE CARD NUMBERS ARE SORTED BY 6 DIGIT PRODUCT IDENTIFIER
40
RANDOM 8 DIGIT NUMBER GENERATED ON THE CHARGE CARD PROVIDER'S SERVER AND APPENDED TO BIN NUMBER
41
IS THE SECURE TRANSACTION NUMBER AVAILABLE?
NO
42
> 3 ATTEMPTS ?
NO
44
YES
YES
46
CHECK DIGIT IS CALCULATED AND APPENDED TO THE NUMBER
43
OBTAIN UNUSED NUMBER FROM STN DATABASE
ASSOCIATE NEW SECONDARY TRANSACTION NUMBER TO THE PRIMARY CHARGE CARD AND MAKE ENTRY INTO APPROPRIATE TABLE ON STN DATABASE
45

FIG. 10

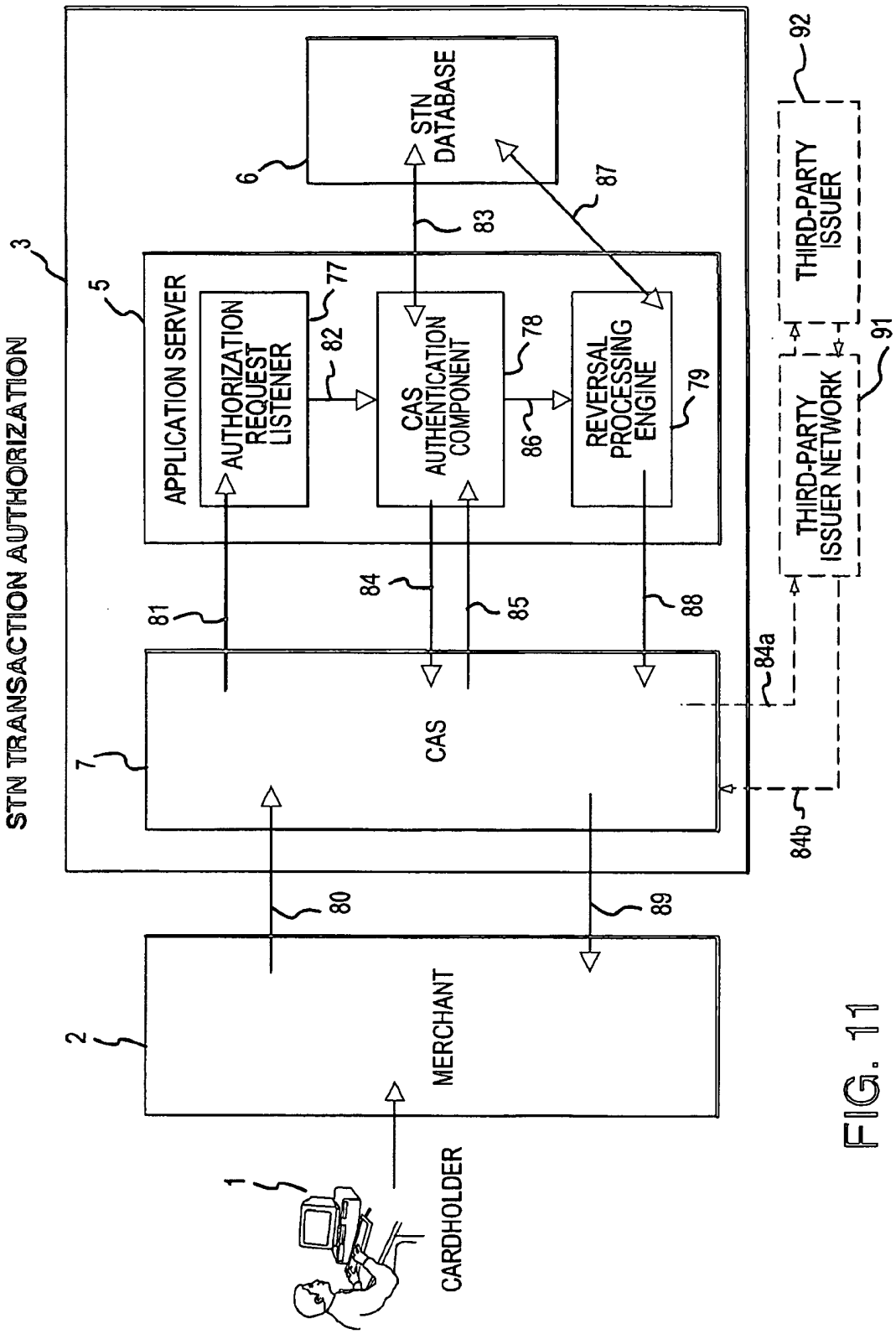

STN TRANSACTION AUTHORIZATION
3
5
APPLICATION SERVER
AUTHORIZATION REQUEST LISTENER
77
82
CAS AUTHENTICATION COMPONENT
78
86
REVERSAL PROCESSING ENGINE
79
6
STN DATABASE
83
87
92
THIRD-PARTY ISSUER
91
THIRD-PARTY ISSUER NETWORK
81
84
85
88
84a
84b
7
CAS
80
89
2
MERCHANT
1
CARDHOLDER

FIG. 11

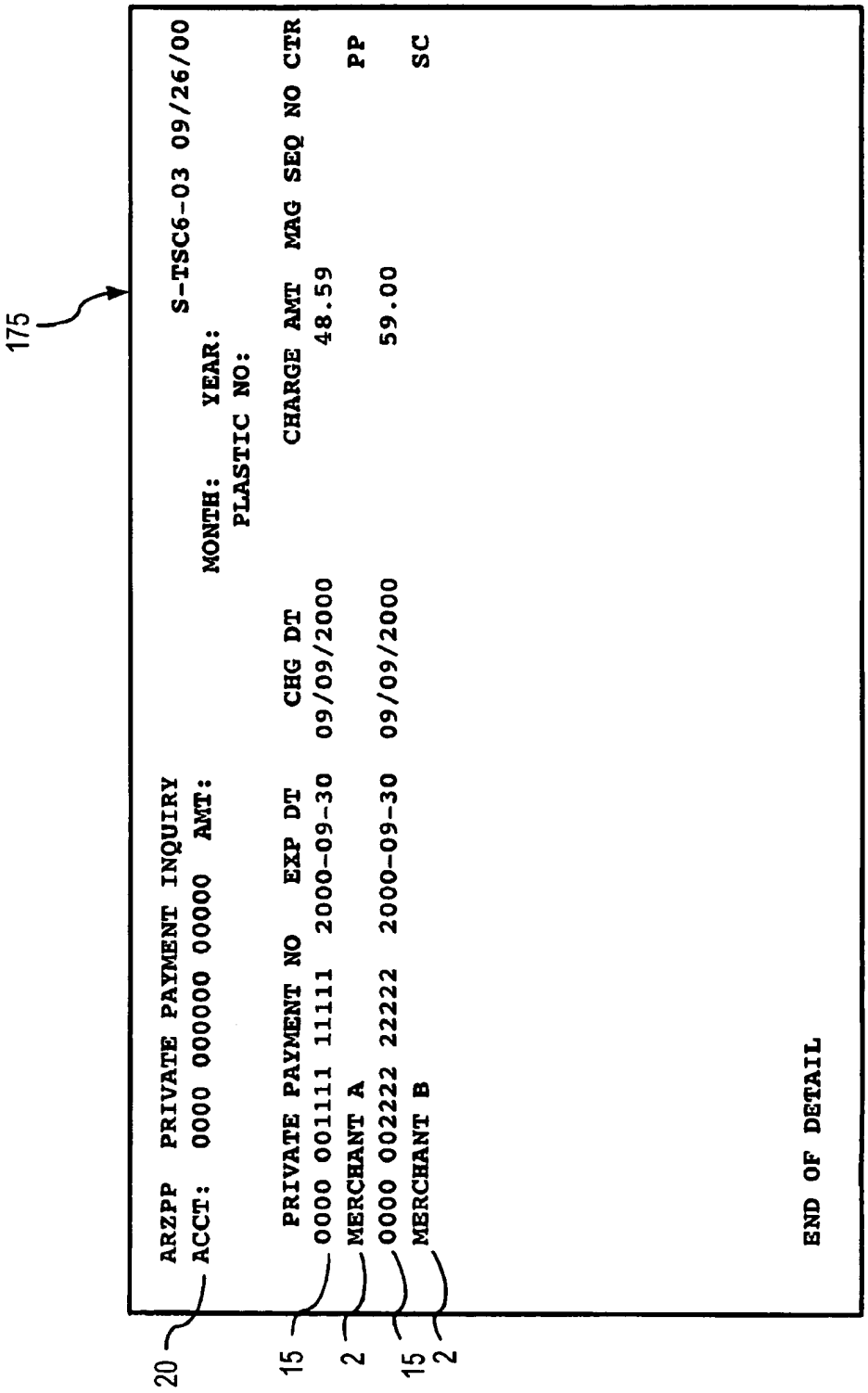

175
ARZPP PRIVATE PAYMENT INQUIRY S-TSC6-03 09/26/00
ACCT: 0000 000000 00000 AMT: MONTH: YEAR:
PLASTIC NO:
PRIVATE PAYMENT NO EXP DT CHG DT CHARGE AMT MAG SEQ NO CTR
0000 001111 11111 2000-09-30 09/09/2000 48.59
MERCHANT A PP
0000 002222 22222 2000-09-30 09/09/2000 59.00
MERCHANT B SC
END OF DETAIL
20
15
2
15
2

FIG. 12

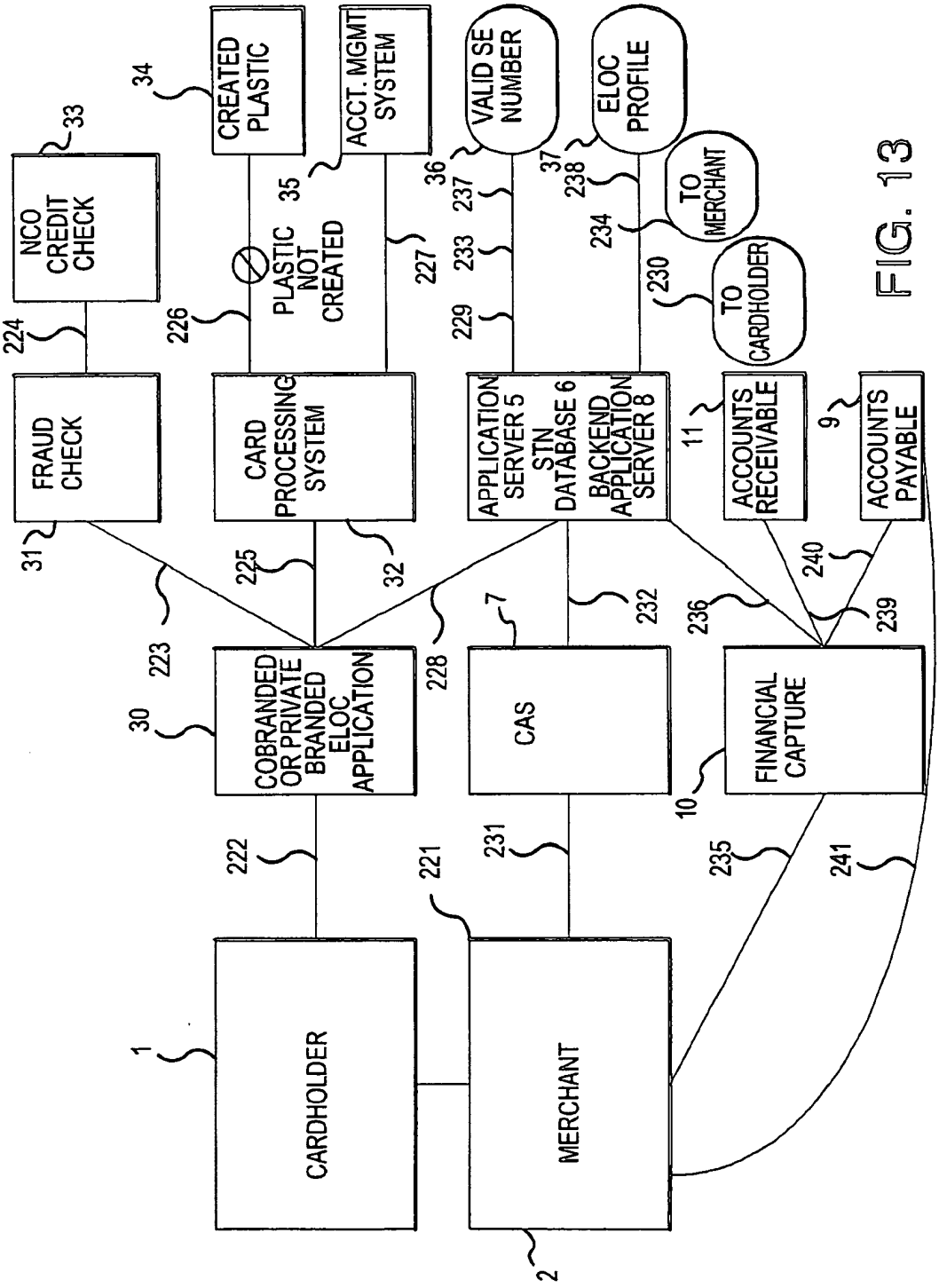

CARDHOLDER
1
MERCHANT
2
COBRANDED OR PRIVATE BRANDED ELOC APPLICATION
30
CAS
7
FINANCIAL CAPTURE
10
FRAUD CHECK
31
CARD PROCESSING SYSTEM
32
APPLICATION SERVER 5 STN DATABASE 6 BACKEND APPLICATION SERVER 8
ACCOUNTS RECEIVABLE
11
ACCOUNTS PAYABLE
9
NCO CREDIT CHECK
33
CREATED PLASTIC
34
PLASTIC NOT CREATED
35
ACCT. MGMT SYSTEM
VALID SE NUMBER
36
ELOC PROFILE
37
TO MERCHANT
TO CARDHOLDER
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241

FIG. 13

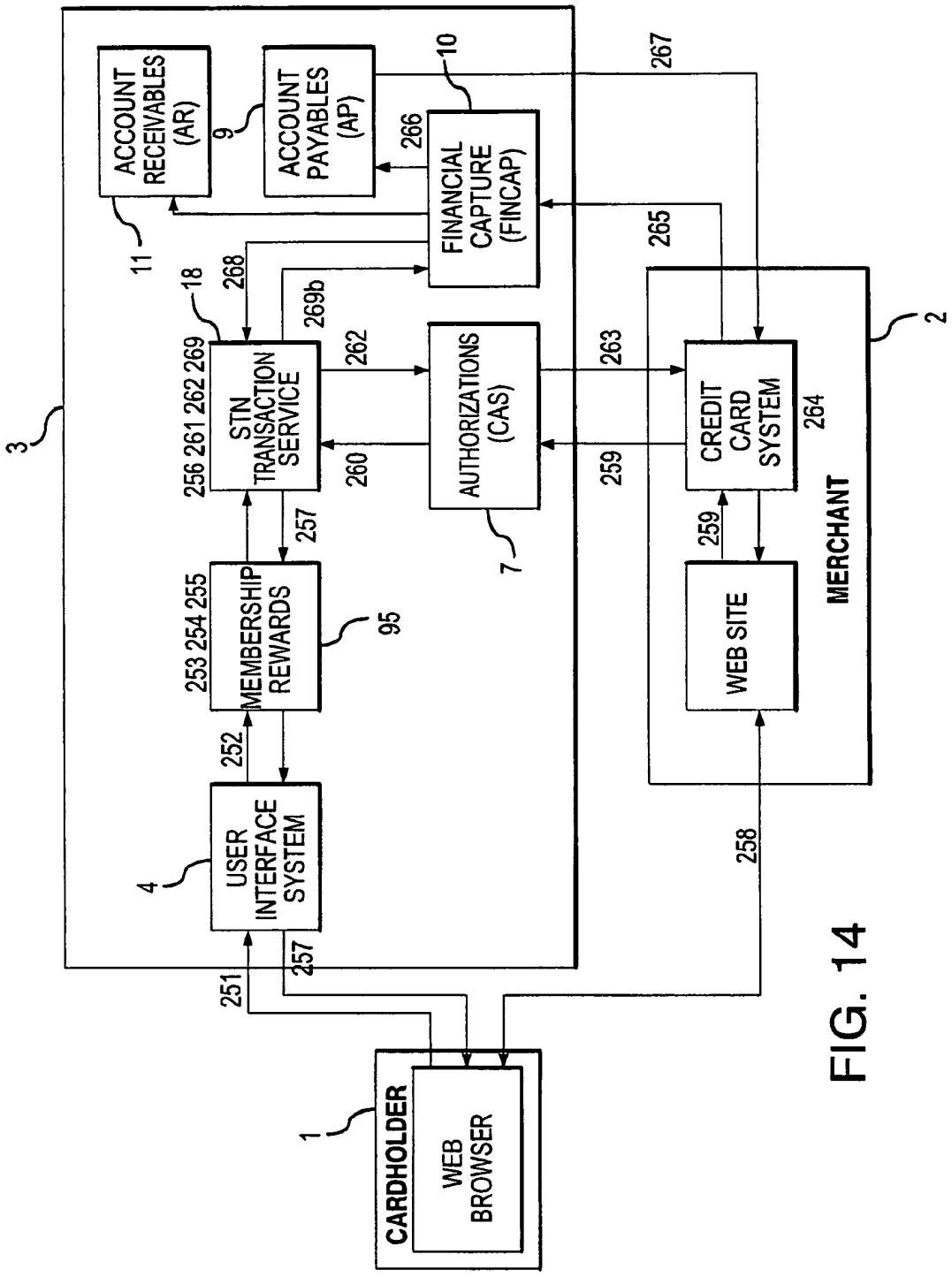

ACCOUNT RECEIVABLES (AR)
ACCOUNT PAYABLES (AP)
FINANCIAL CAPTURE (FINCAP)
STN TRANSACTION SERVICE
AUTHORIZATIONS (CAS)
CREDIT CARD SYSTEM
MEMBERSHIP REWARDS
USER INTERFACE SYSTEM
WEB SITE
MERCHANT
CARDHOLDER
WEB BROWSER
1
2
3
4
7
9
10
11
18
95
251
252
253 254 255
256 261 262 269
257
258
259
260
262
263
264
265
266
267
268
269b

FIG. 14

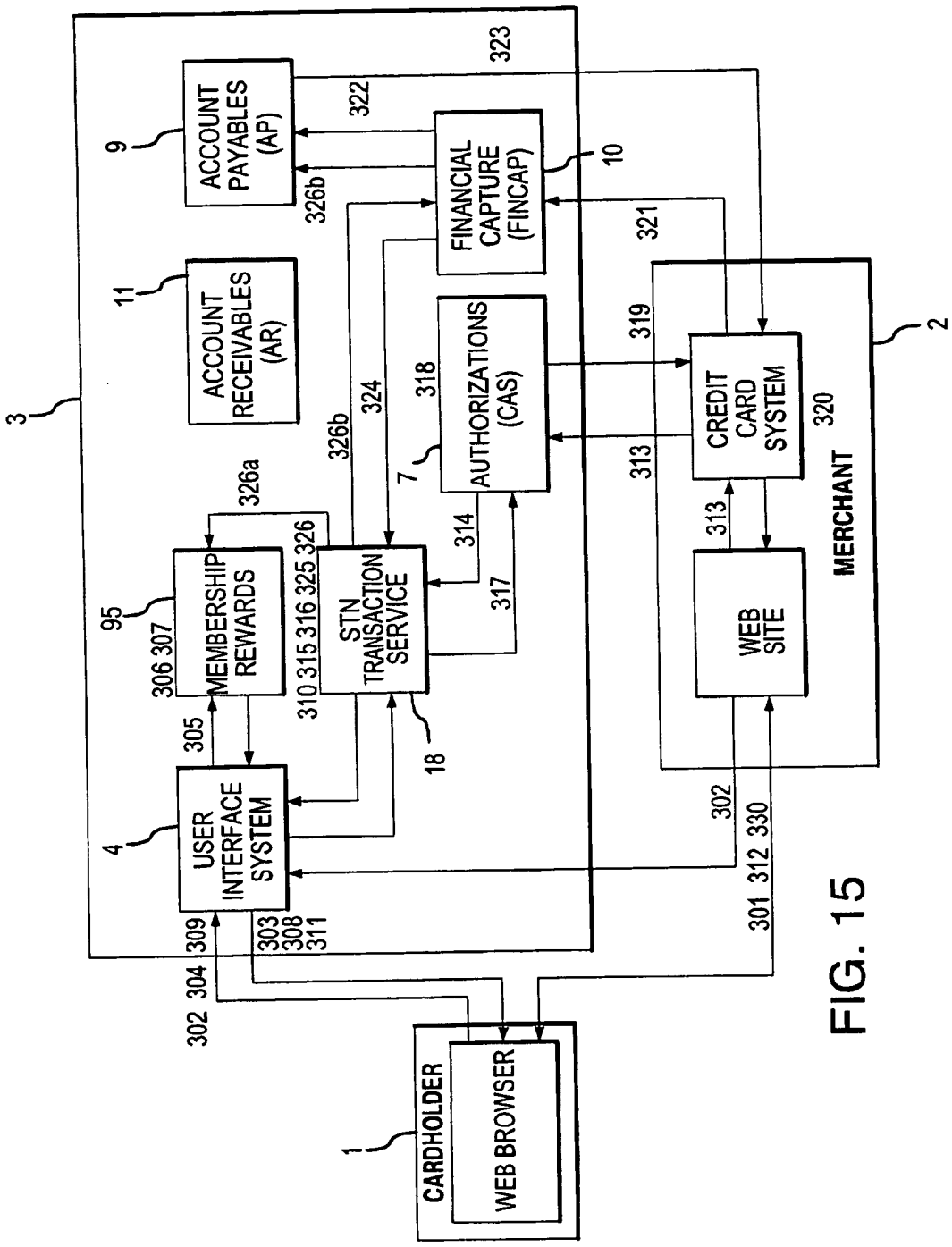

ACCOUNT PAYABLES (AP)
9
322
323
FINANCIAL CAPTURE (FINCAP)
10
326b
321
ACCOUNT RECEIVABLES (AR)
11
AUTHORIZATIONS (CAS)
318
319
CREDIT CARD SYSTEM
320
MERCHANT
2
3
324
326b
7
326a
313
MEMBERSHIP REWARDS
95
306 307
STN TRANSACTION SERVICE
310 315 316 325 326
314
317
WEB SITE
313
305
18
USER INTERFACE SYSTEM
4
302
309
303
308
311
301 312 330
304
302
CARDHOLDER
WEB BROWSER
1

FIG. 15

SYSTEM FOR FACILITATING A TRANSACTION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to, and the benefit of, U.S. provisional applications: (1) Ser. No. 60/187,620, filed Mar. 7, 2000, (2) Ser. No. 60/200,625, filed Apr. 28, 2000, and (3) Ser. No. 60/213,323, filed Jun. 22, 2000, all of which are hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention generally relates to a system for facilitating transactions utilizing a secondary transaction number that is associated with a primary transaction card. More particularly, the system allows a cardholder to pay a merchant with a private, limited-use, transaction number without the need to disclose to the merchant or others the cardholder's primary charge card number. Moreover, the present invention provides registration, number generation and association, authorization, settlement and customer service processes that achieve an improved secure and private transaction system.

BACKGROUND OF THE INVENTION

[0003] The proliferation of the Internet has resulted in a thriving electronic commerce industry, where more and more products and services are available to consumers in a variety of non-traditional ways, e.g., internet, telephone sales, wireless, interactive TV, etc. For example, in traditional online consumer-merchant transactions, consumers typically provide merchants with transaction numbers (e.g, charge card numbers) from their existing debit, phone, credit or other transaction/service cards (e.g., American Express®, VISA®, MasterCard® and Discover Card®, AT&T®), MCI®), etc.). Transmission of transaction numbers via these traditional means has created increased opportunities for fraud. Namely, it is possible for these numbers to be intercepted during transmission, after transmission, while being stored electronically or at the merchant's online or offline location. In light of the increase in charge card fraud involving situations where the physical charge card is not actually presented to the merchant, consumers are becoming increasingly cautious and leery of giving out their actual charge card number to merchants (or other unknown third parties asserting to be merchants).

[0004] In traditional online purchases, a consumer often browses the Internet for items to purchase. When the consumer finds an item that he or she is interested in purchasing, the consumer typically selects an item to add to a virtual shopping cart. When the consumer has finished shopping, and desires to purchase an item, the consumer usually proceeds to a virtual checkout, where the consumer is prompted for payment and delivery information. The consumer then typically is required to enter the appropriate delivery and credit card information, where the the consumer reads the credit card number directly from the consumer's physical credit card. This information is then transmitted electronically to the merchant via a public internet network. Although the transmission is often encrypted, there exists the possibility that the number will be intercepted en route to the merchant. More likely, however, is that the number will be fraudulently used by an unscrupulous third party, such as a dishonest employee of the merchant.

[0005] In addition to the previous example, various other means of credit card skimming are common in the industry. In an attempt to minimize these and similar problems relating to credit card fraud, banks and other credit card institutions have begun to explore various ways to provide customers with temporary transaction numbers to facilitate online transactions, where the actual credit card is not disclosed to the merchant or any other third party.

[0006] For example, U.S. Pat. No. 5,883,810 issued to Franklin, et al., which is hereby incorporated by reference, discloses a system to facilitate online commerce where a customer is able to register and sign-up for an "online commerce card." This online commerce card does not exist in physical form, but instead exists in a digital form that can be electronically configured for online commerce. The issuing bank issues the digital card to the customer in the form of a signed digital certificate binding the customer to the bank and provides the customer a software module that can be invoked when using the commerce card to conduct an online transaction. This online commerce card is assigned a permanent customer account number that resides with the issuing bank and is not given to the customer. In Franklin, when a customer desires to make an online purchase, the customer requests from the bank a transaction number that is good for a single transaction and with a limited life. This single transaction number is provided to a merchant to complete a purchase and is then processed by the merchant for authorization and settlement, with the issuing bank substituting and re-substituting the single transaction number and the customer account number as necessary in order to insure that the actual account number is not released to any third party.

[0007] Although the single use transaction number disclosed by Franklin provided some improvement over the traditional online transaction methods, several problems remained. For example, Franklin's system, which requires the generation of a digitally keyed online commerce card that does not exist in the physical form, requires customers to register and use an assigned digital certificate. Furthermore, this system requires the customer to download modules to facilitate the registration and transaction processes. Although Franklin notes that the commerce card is configured to be used by the customer in one or more areas of commerce in which the customer typically employs a charge card, Franklin fails to disclose how a consumer's existing plastic credit card number could be used to facilitate transactions. Specifically, Franklin requires instead, for the cardholder to sign-up and register in advance for an online commerce card that is not the cardholder's existing physical credit card, but is a non-physical digital card. Furthermore, the Franklin single transaction number will not work for multiple payment arrangements, i.e., where there is one purchase but multiple payment components.

[0008] Additional publications also disclose efforts to make transactions more secure, such as, for example, PCT Application, WO 99\49424, published on Sep. 30, 1999, and PCT Application WO 99\49586, published on Aug. 24, 2000 (collectively "Orbis"), hereby incorporated by reference, which attempt to expand and improve on the use of temporary transaction numbers. Specifically, Orbis discloses the use of a limited use credit card number that is associated with a master credit card (e.g., a physical credit card).

[0009] Orbis discloses using this limited use credit card number for transactions with merchants so that the physical credit card is not disclosed to the merchant or other third parties. In Orbis, for example, the bank or credit card provider issues the cardholder a non-activated limited use credit card number that is associated with the cardholder's master credit card. In an online transaction, the cardholder activates the limited use credit card and provides that number to the merchant to complete a transaction. On presentment to the card provider for authorization, the card provider verifies, inter alia, that the conditions of use have been met. If the conditions have been met, the card provider provides the merchant with an approval code that will accompany the payment request during settlement. If, however, during the authorization process, it is determined that certain conditions of use have not been met, the card provider de-activates the limited-use card. With the limited-use credit card de-activated, the merchant will not be paid and the transaction is not able to proceed through settlement. Conversely, if the limited use number is not submitted at all for authorization, and the merchant chooses to process this transaction for settlement, settlement may later occur and the merchant may be paid, with the incumbent risk to the merchant, however, that charge-back is likely if the charge is later disputed by the cardholder.

[0010] In prior art systems, if a transaction involving a temporary number is not authorized for failing to meet certain limited-use conditions, the number is deactivated and will not be processed through settlement. In real world environments, this creates certain problems. For instance, many online or telephonic purchases are multiple payment purchases, where one product may be purchased but multiple periodic payments are used to complete the transaction. Although the consumer is usually provided with the product up front, there may be occasions where the product is not delivered until all payments have been completed. The prior art systems occasionally create situations where the temporary transaction number is deactivated at some point in the multiple payment process where the merchant is not fully paid, possibly resulting in the product not being delivered to the consumer.

[0011] As previously noted, prior art systems typically use the authorization process to determine whether limited-use conditions are satisfied. The resultant comparison utilized in the authorization process is then used to update a conditions database. However, the consumer rarely knows exactly how many authorization requests will be submitted by the merchant. For example, a consumer may purchase an item online for $1000, agreeing to apply ten monthly $100 payments to complete the purchase. Initially, one employing a prior art system may think to apply a number of different limited use conditions to facilitate this transaction, e.g., one transaction for $1000, ten transactions for $100, or any combination. Additionally, different merchants may handle authorization requests in a number of different ways. A merchant may send to the card provider (i) only one authorization request for $1000; (ii) one authorization request for $1000, followed by subsequent authorization requests for each $100 payment; (iii) one authorization request for each $100 payment, or (iv) only a few periodic authorization requests. It is also common in the industry for merchants to submit pre-authorization requests followed by a subsequent request for authorization. In sum, it can be difficult for the consumer to guess exactly what method will be employed by the merchant to facilitate the authorization process.

[0012] As such, the prior art systems create situations where a temporary transaction number may be inadvertently deactivated prior to completion of the periodic payments. If, for example, the consumer only authorized one transaction, the card would be deactivated where the merchant submits one pre-authorization request, followed by a second authorization request prior to the first payment.

SUMMARY OF THE INVENTION

[0013] The present invention facilitates transactions between a first party (referred to herein as "cardholder") and a second party (referred to herein as "merchant") by providing the cardholder with a secondary transaction number that is associated with a cardholder's primary account, (e.g., charge card), wherein the cardholder presents or transmits the transaction number—not the primary charge card number—to the merchant to initiate a transaction.

[0014] More particularly, the system involves the process of registering a cardholder (if not already pre-registered) to participate in a transaction system; generating a secondary transaction number and issuing this number to the cardholder, where the cardholder presents this number to a merchant to complete a sales transaction; the merchant processing this secondary transaction number, similar to any other credit card number, where the number is typically presented to the credit card provider for authorization. Throughout this process, the cardholder's primary charge card number is never passed to the merchant or any other third party. Additionally, the secondary transaction number may also carry with it certain limitations-on-use conditions, where the transaction is not authorized unless these conditions are met.

[0015] In generating a secondary transaction number, upon a cardholder's request, the card provider generates a random number and associates this number with the cardholder's primary charge card account. This instantaneous and immediate generation of a random number allows for the number to be used by the cardholder immediately upon receipt. This process obviates the need for separate activation of the secondary transaction number, and minimizes the possibility that a secondary transaction number, once issued, will not be utilized because the cardholder or card provider failed to "activate" it.

[0016] During the authorization phase of the transaction process, the card provider receives the merchant's authorization request and verifies that certain limitations-on-use conditions, if any, have been satisfied. If the conditions have been satisfied, the request is approved and the card provider sends the merchant an approval code. If conditions have not been met, the request is declined. Although the request is declined, in an exemplary embodiment, the secondary transaction number is not "deactivated," and, as a result, may still continue through the payment process.

[0017] An exemplary settlement process of the present invention involves receiving a request from a merchant to be paid for a particular transaction and paying the merchant. As noted above, even a secondary transaction number that has not been authorized or that has been denied authorization by the card provider, may proceed through settlement, with the

incumbent risk to the merchant that the transaction (if not accompanied by a valid approval code) may later be charged back to the merchant if the transaction is ever disputed. During the settlement process, the accounts payable system pays the merchant, referencing only the secondary transaction number. However, prior to the accounts receivable processing, the secondary transaction number is replaced with the primary account for cardholder billing. The cardholder's statement may reflect, as desired, the secondary transaction number(s), the primary account number(s), all numbers or any combination of these numbers.

[0018] The dispute handling and customer service processes of an exemplary embodiment of this invention enable customer service representatives to retrieve information and initiate customer or merchant inquiries based on the primary account number, the secondary transaction number or other transaction specific information provided by either the cardholder or the merchant. Therefore, the cardholder may provide either the primary account number or the secondary transaction number to the customer service representative to initiate a dispute. With either number, the representative is able to look-up the associated account number and account information. The system provides seamless integration of the secondary transaction number and the primary account (i.e., charge card) number to ensure that the merchant only sees statements, reports, letters, or financial adjustments bearing the secondary transaction number —not the charge card number, while the cardholder need only reference the primary charge card account. Additionally, it is through the dispute handling process that the cardholder may dispute a transaction involving, inter alia, an unauthorized use of the secondary transaction number and it is during this process that the transaction amount is charged back to the merchant. Other situations involving a merchant charge-back may include duplicate billing; service or item not received; item returned; or wrong amount billed.

[0019] Various embodiments of the present transaction system incorporate, and improve upon, existing or developing technologies, such as, for example, non-currency based programs and loyalty systems, electronic lines of credit, online banking, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Additional aspects of the present invention will become evident upon reviewing the non-limiting embodiments described in the specification and the claims taken in conjunction with the accompanying figures, wherein like reference numerals denote like elements.

[0021] **FIG. 1** is an overview of an exemplary system for facilitating a transaction.

[0022] **FIG. 2** is a flow diagram of exemplary processes of the present invention;

[0023] **FIG. 3** is a web page screen shot of a card provider's exemplary splash page for a transaction system;

[0024] **FIG. 4** is a web page screen shot of a card provider's exemplary online registration page for a transaction system;

[0025] **FIG. 5** is a web page screen shot of a card provider's exemplary online login page for a transaction system;

[0026] **FIG. 6** is a web page screen shot of a card provider's exemplary online drop-down menu used to select a primary charge card in the foreground and an online merchant's payment web page in the background;

[0027] **FIG. 7** is a web page screen shot, displaying in the foreground, an exemplary secondary transaction number (e.g., Private Payments™ number) returned to the user; and in the background, a merchant's payment web page;

[0028] **FIG. 8** is a block diagram of exemplary components of the present invention;

[0029] **FIG. 9** is a block diagram of an example of some of the exemplary data structure of the STN database of the present invention;

[0030] **FIG. 10** is a flow chart of an exemplary secondary transaction number generation process of the present invention;

[0031] **FIG. 11** is a flow diagram of an exemplary transaction authorization phase of the present invention;

[0032] **FIG. 12** is an screen shot of an exemplary transaction history report of the present invention;

[0033] **FIG. 13** is a flow diagram depicting an exemplary embodiment of the present invention involving an electronic line of credit system;

[0034] **FIG. 14** is a flow diagram depicting one embodiment of an exemplary transaction system of the present invention used to facilitate a non-currency based membership rewards program;

[0035] **FIG. 15** is a flow diagram depicting a second embodiment of an exemplary transaction system of the present invention used to facilitate a membership rewards program.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0036] As background, the various prior art methods for implementing transactional systems utilizing temporary numbers have failed to satisfy certain consumer demands for more secure and confident transactions. Specifically, the prior art systems have typically required, inter alia, (i) additional software to provide registration and transaction processes, (ii) the generation of a separate digital certificate embodying a non-physical online commerce card, (iii) separate activation of the temporary transaction number; or (vi) a deactivation of the temporary number if predefined conditions are not met. In short, previous transaction systems have not sufficiently adapted to real world demands for a more secure and confident transaction system that is readily compatible with existing banking and electronic commerce systems.

[0037] The present invention includes a unique system for facilitating transactions that is easily and readily adaptable to existing commercial transaction processing systems. While the system may contemplate upgrades or reconfigurations of existing processing systems, changes to cardholder or merchant systems are not necessarily required by the present invention. For example, the present system may contemplate, but does not require: downloading of software modules; a digitally-based, non-physical commerce card; activation or deactivation of the secondary transaction num-

ber; and certain embodiments do not require the existing online customer to separately register for the service. Moreover, the transaction system herein described can be seamlessly integrated into current electronic commerce processes with minimal to no changes to existing systems used by cardholders or merchants.

[0038] The transaction system of the present invention may be described herein in terms of functional block components, flow charts, screen shots, optional selections and various processing steps. It should be appreciated that such functional blocks may be realized by any number of hardware and/or software components configured to perform the specified functions. For example, the present invention may employ various integrated circuit components, e.g., memory elements, processing elements, logic elements, look-up tables, and the like, which may carry out a variety of functions under the control of one or more microprocessors or other control devices. Similarly, the software elements of the present invention may be implemented with any programming or scripting language such as C, C++, Java, COBOL, assembler, PERL, or the like, with the various algorithms being implemented with any combination of data structures, objects, processes, routines or other programming elements. Further, it should be noted that the present invention may employ any number of conventional techniques for data transmission, signaling, data processing, network control, and the like. For a basic introduction of cryptography, please review a text written by Bruce Schneider which is entitled "Applied Cryptography: Protocols, Algorithms, And Source Code In C," published by John Wiley & Sons (second edition, 1996), which is hereby incorporated by reference.

[0039] It should be appreciated that the particular implementations shown and described herein are illustrative of the invention and its best mode and are not intended to otherwise limit the scope of the present invention in any way. Indeed, for the sake of brevity, conventional data networking, application development and other functional aspects of the systems (and components of the individual operating components of the systems) may not be described in detail herein. Furthermore, the connecting lines shown in the various figures contained herein are intended to represent exemplary functional relationships and/or physical couplings between the various elements. It should be noted that many alternative or additional functional relationships or physical connections may be present in a practical electronic transaction system.

[0040] It will be appreciated, that many applications of the present invention could be formulated. One skilled in the art will appreciate that a network may include any system for exchanging data or transacting business, such as the Internet, an intranet, an extranet, WAN, LAN, satellite or wireless communications, and/or the like. The cardholder may interact with the card provider's transaction system or a merchant via any input device such as a telephone, keyboard, mouse, kiosk, personal digital assistant, touch screen, voice recognition device, transponder, biometrics device, handheld computer (e.g., Palm Pilot®), cellular phone, web TV, web phone, blue tooth/beaming device and/or the like. Similarly, the invention could be used in conjunction with any type of personal computer, network computer, workstation, minicomputer, mainframe, or the like running any operating system such as any version of Windows, Windows NT, Windows2000, Windows 98, Windows 95, MacOS, OS/2, BeOS, Linux, UNIX, or the like. Moreover, although the invention uses protocols such as TCP/IP to facilitate network communications, it will be readily understood that the invention could also be implemented using IPX, Appletalk, IP-6, NetBIOS, OSI or any number of existing or future protocols. Moreover, the system contemplates the use, sale, exchange, transfer, or any other distribution of any goods, services or information over any network having similar functionality described herein.

[0041] As will be appreciated by one of ordinary skill in the art, the present invention may be embodied as a method, a data processing system, a device for data processing, and/or a computer program product. Accordingly, the present invention may take the form of an entirely software embodiment, an entirely hardware embodiment, or an embodiment combining aspects of both software and hardware. Furthermore, the present invention may take the form of a computer program product on a computer-readable storage medium having computer-readable program code means embodied in the storage medium. Any suitable computer-readable storage medium may be utilized, including hard disks, CD-ROM, optical storage devices, magnetic storage devices, flash card memory and/or the like.

[0042] Communication between the parties (e.g., cardholder, card provider, and/or merchant) to the transaction and the system of the present invention may be accomplished through any suitable communication means, such as, for example, a telephone network, Intranet, Internet, point of interaction device (point of sale device, personal digital assistant, cellular phone, kiosk, etc.), online communications, off-line communications, wireless communications, and/or the like. One skilled in the art will also appreciate that, for security reasons, any databases, systems, or components of the present invention may consist of any combination of databases or components at a single location or at multiple locations, wherein each database or system includes any of various suitable security features, such as firewalls, access codes, encryption, de-encryption, compression, decompression, and/or the like.

[0043] The present invention is described below with reference to block diagrams and flowchart illustrations of methods, apparatus (e.g., systems), and computer program products according to various aspects of the invention. It will be understood that each functional block of the block diagrams and the flowchart illustrations, and combinations of functional blocks in the block diagrams and flowchart illustrations, respectively, can be implemented by computer program instructions. These computer program instructions may be loaded onto a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions which execute on the computer or other programmable data processing apparatus create means for implementing the functions specified in the flowchart block or blocks.

[0044] These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means which implement the function specified in the flowchart block or blocks.

The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer-implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the flowchart block or blocks.

[0045] Accordingly, functional blocks of the block diagrams and flowchart illustrations support combinations of means for performing the specified functions, combinations of steps for performing the specified functions, and program instruction means for performing the specified functions. It will also be understood that each functional block of the block diagrams and flowchart illustrations, and combinations of functional blocks in the block diagrams and flowchart illustrations, can be implemented by either special purpose hardware-based computer systems which perform the specified functions or steps, or suitable combinations of special purpose hardware and computer instructions.

[0046] Referencing the computer networked aspect of a preferred embodiment of this invention, each participant is equipped with a computing system to facilitate online commerce transactions. The computing units may be connected with each other via a data communication network. The network is a public network and assumed to be insecure and open to eavesdroppers. In the illustrated implementation, the network is embodied as the internet. In this context, the computers may or may not be connected to the internet at all times. For instance, the cardholder computer may employ a modem to occasionally connect to the internet, whereas the card provider computing center might maintain a permanent connection to the internet. It is noted that the network may be implemented as other types of networks, such as an interactive television (ITV) network.

[0047] The merchant computer and the card provider computer may be interconnected via a second network, referred to as a payment network. The payment network represents existing proprietary networks that presently accommodate transactions for credit cards, debit cards, and other types of financial/banking cards. The payment network is a closed network that is assumed to be secure from eavesdroppers. Examples of the payment network include the American Express®, VisaNet® and the Veriphone® network.

[0048] As depicted in **FIG. 1**, the present invention generally relates to a transaction system where a first party to a transaction ("cardholder **1**") provides to a second party to a transaction ("merchant **2**") a secondary transaction number (STN) **15** that was generated by an issuer ("card provider **3**"). In a preferred embodiment, although not required, the STN **15** is immediately usable by the cardholder **1** without need for activation and may have associated therewith cardholder **1**, card provider **3**, or merchant **2** defined conditions or parameters of use restrictions which limit use of the STN **15**. A "transaction," as defined herein, includes, inter alia, any exchange or delivery of value, exchange or delivery of data, gifting of value or data, etc. The term "transaction" not only contemplates an exchange of goods or services for value from one party to another, but also the gifting of something from one party to another. Additionally, transaction or charge card numbers are account numbers that are used to facilitate any type of transaction.

[0049] While an exemplary embodiment of the invention is described in association with a transaction system, the invention contemplates any type of networks or transaction systems, including, for example, unsecure networks, public networks, wireless networks, closed networks, open networks, intranets, extranets, and/or the like.

[0050] The first party to the transaction (referred to herein as a "cardholder **1**") is any individual, business or other entity who uses a STN **15** to facilitate any transaction. In a preferred embodiment, the cardholder **1** establishes a new or has an existing relationship or association with a card provider **3**. For example, in one embodiment, a cardholder **1** may be an American Express®) card member. In another embodiment, a cardholder **1** may be a participant in a frequent flyer rewards program. In a further embodiment, the cardholder **1** is a member of any suitable organization that provides transaction products or services. Another embodiment contemplates the cardholder gifting a secondary transaction number to a second party. The term cardholder **1** may also be referred to herein as "consumer,""card member,""user,""customer" or the like.

[0051] The second party to the transaction (referred to herein as a "merchant **2**") is any individual, business, or other entity who receives a secondary transaction number, whether or not in exchange for goods or services. For example, in one embodiment, a merchant **2** may be an online bookstore such as Amazon.com®. In another embodiment, a merchant **2** may be a local plumber. In yet another embodiment, a merchant **2** may be a local hardware store. In some instances, the cardholder **1** and the merchant **2** may be the same. In other situations, the merchant **2** and the card provider **3** are the same. Although referred to herein as a "merchant," this term contemplates situations where any second party receives a secondary transaction number from the first party: such as, for example, where a cardholder **1** gifts a secondary transaction number to another individual (i.e., second party merchant).

[0052] The issuer ("card provider **3**") includes any provider of products and/or services that facilitates any type of transaction. As contemplated by an exemplary embodiment of the present invention, the card provider **3** establishes and maintains account and/or transaction information for the cardholder **1**. The card provider **3** may issue products to the cardholder **1** and may also provide both the cardholder **1** and the merchant **2** with the processes to facilitate the transaction system of the present invention. The card provider **3** includes banks; credit unions; credit, debit or other transaction-related companies, telephone companies; or any other type of card or account issuing institutions, such as card-sponsoring companies, incentive rewards companies, or third party providers under contract with financial institutions. Unless otherwise specifically set forth herein, although referred to as "card provider," this term should be understood to mean any entity issuing any type of account to facilitate any transaction, exchange or service; and should not be limited to companies possessing or issuing physical cards. In an exemplary system, the card provider **3** may be any transaction facilitating company such as a charge card provider like American Express®, VISA®, Mastercard®, Discover®, etc. In another embodiment, the card provider **3** could be any membership organization or union. In some instances, the card provider **3** and the merchant **2** may be the same, for example, where the STN **15** is issued by the same

entity that provides the product or service. A STN **15** phone card issued by a telephone company, where the STN **15** phone card is tied to a primary telephone account is one such occasion.

[0053] An exemplary STN **15** is any transaction number, code, symbol, indicia, etc. that is associated with another number or account that has been designated by the cardholder **1** or the card provider **3** as a primary charge card (PCC **20**), i.e., primary account number. In an exemplary embodiment, the STN **15** is a purchasing number that acts as a charge card number and is associated with a PCC **20** account (e.g., a main charge card, credit, debit card or other account number, such as a bank or brokerage account, reward program account, etc.). In an exemplary embodiment, a PCC **20** account is not identified by a STN **15**. In certain embodiments, the PCC **20** account may have some identifying elements related to the STN **15**. The PCC **20** is defined herein to include any type of transaction card that references any account, membership, affiliation or association. When more than one cardholder **1** account exists, the PCC **20** is the account that has been designated by the cardholder **1** or the card provider **3** as the primary account. Alternatively, there may be a hierarchy of accounts where the STN **15** is associated with one or more PCCs **20** in a designated order. Additionally, as depicted in at least one embodiment described herein, a STN **15** may be associated with two or more accounts. For example, a STN **15** could be associated with a non-currency based account and also a PCC **20** account.

[0054] As shown in **FIG. 1**, in a preferred embodiment, the STN **15** and the PCC **20** have the same format, although additional embodiments may provide for account numbers with varying formats. In an exemplary embodiment involving credit, debit or other banking cards, the STN **15** has the same industry standard format that is used for the regular banking cards (e.g., 15 or 16 digit numbers). Preferably, the numbers are formatted such that one is unable to tell the difference between a STN **15** and a regular physical charge card. Alternatively, however, the card provider/product identifier (e.g., BIN range, first **6** digits, etc.) numbers may be different so as to differentiate the STNs from regular charge card numbers. In referencing the STN **15** and the PCC **20** number, it should be appreciated that the number may be, for example, a sixteen-digit credit card number, although each card provider has its own numbering system, such as the fifteen-digit numbering system used by American Express. Each company's card numbers comply with that company's standardized format such that a company using a sixteen-digit format will generally use four spaced sets of numbers, as represented by the number "0000 0000 0000 0000." The first five to seven digits are reserved for processing purposes and identify the issuing bank, card type etc. In this example, the last sixteenth digit is used as a sum check for the sixteen-digit number. The intermediary eight-to-ten digits are used to uniquely identify the cardholder **1**. The invention contemplates the use of other numbers, indicia, codes or other security steps in addition to the use of the STN **15**, but in an exemplary embodiment, only the STN **15** is provided to the merchant **2**.

[0055] In a preferred embodiment, the STN **15** is randomly and instantaneously generated by the card provider **3**, usually upon a cardholder's request, and can be distributed to the cardholder **1** by a variety of methods (online, telephone, wireless, email, regular mail, etc.) all of which should be secure and dependent upon verification of the cardholder's identity. Unlike the temporary transaction numbers disclosed in the prior art previously discussed, in a preferred embodiment, although not required, the STN **15** is immediately active (and usable) once it is associated with the cardholder's designated PCC **20** and provided to the cardholder **1**. This feature minimizes the possibility that a merchant **2** will obtain a transaction number that will be worthless because it was not properly activated by the cardholder **1**. While the present invention may contemplate a previously allocated pool of numbers that needs to be activated, an exemplary embodiment of the present invention includes STNs **15** that are instantaneously and randomly generated, and are usable upon receipt by the cardholder **1** without the need for separate activation.

[0056] In another preferred embodiment, the STN **15** may have limited-use (or conditions-of-use) parameters placed upon it by either the cardholder **1**, merchant **2**, or the card provider **3** in order for the numbers to be restricted for particular uses. Alternatively, the cardholder **1** is able to choose system default parameters of use. Parameters may include, for example: (i) use of the STN **15** is good for a predetermined number of transactions; (ii) cardholder-determined expiration dates (i.e., STN **15** will be generated with expiration dates that are associated but unrelated to the expiration date of the cardholder's PCC **20** number, other than that it cannot exceed the expiration date of the PCC **20** account); (iii) limiting use of the STN **15** to a specified dollar amount, dollar amount per transaction, total dollar amount for pre-designated number of transactions, maximum dollar amount per month, etc.; (iv) use of the STN **15** for a specified merchant only; (v) restricting use to a specified user, other than primary cardholder (e.g., child, spouse, gift recipient, etc.); or (vi) any combination of these or similar features, for example, a number can be used at a specified merchant only for a pre-designated number of transactions and for a maximum dollar amount. In an exemplary online embodiment, a cardholder **1** may desire to require all online transactions (e.g., purchases) be performed using only STNs, or alternatively, be performed only with specific merchants as defined. If the cardholder (or another individual) uses a physical charge card number for an online payment in violation of this condition, the card provider **3** would decline the authorization.

[0057] These parameters not only provide increased security, allowing a cardholder **1** to tailor the STN **15** to a particular use, but an ancillary benefit is the ability of a cardholder to select preferences to control spending for themselves or others who have registered eligibility to use the card (e.g., spouse, children, etc.). These preferences may include: Restrictions (cardholder **1** may choose to restrict use on certain sites or can pre-approve spending at particular sites); date range (cardholder **1** can select a period of time when transactions may occur); maximum budget amount (cardholder **1** can pre-set spending limits within certain periods of time or in certain categories (e.g. groceries, books, clothing)); credit and balance availability (cardholder **1** can check credit or demand deposit balance availability prior to transacting); non-currency based accounts, such as Reward Points as Currency (cardholder **1** can use reward points (e.g. Membership Rewards™ , Blue Loot™) as

currency to pay for purchases); and Gift Products (cardholder 1 can use a STN 15 to fund gift products to others for designated amounts).

[0058] As shown in FIG. 2, an exemplary embodiment of the present invention includes steps for: (i) registering a cardholder 1 to use the card provider's 3 transaction services (step 100); (ii) receiving from a cardholder 1 a request for a STN 15 (step 105); (iii) generating a STN 15, associating the STN 15 with a PCC 20, applying limited-use conditions, if desired, and issuing the STN 15 to the cardholder 1 (step 110); (iv) processing a merchant's 2 authorization request involving the STN 15 to determine if use of the STN is authorized (step 115); (v) processing a settlement request, paying the merchant, and billing the cardholder 1 (step 120); and (vi) handling disputes and other customer service issues from the merchant or cardholder relating to use of the STN 15 (step 125).

[0059] FIG. 8 depicts an overview of the components of an exemplary transaction system. In general, the card provider's computer system utilizes front end 13 and backend 14 processing systems. The front end 13 system comprises, inter alia, a user interface system 4 (e.g., web server, IVR, etc), an application server 5, a STN database 6, and a card authorization system (CAS) 7. The application server 5 and STN database 6 may, at times, be referred to collectively as the STN transaction system (or service) 18. Referencing FIGS. 2 and 8, these front end 13 components facilitate (i) cardholder registration (step 100), (ii) request for a STN 15 (step 105), (ii) generation and issuance of the STN 15 (step 110), and (iv) the STN authorization process (step 115). The backend 14 system comprises, inter alia, a financial capture system 10, a back-end application service 8, an accounts payable system 9 and an accounts receivable system 11. Again referencing FIGS. 2 and 8, the backend 14 components facilitate transaction settlement (step 120). In an exemplary system, the dispute handling and customer service processes (step 125) include, inter alia, in addition to the above mentioned systems, a system for identifying a PCC 20 from a STN 15, a letter generating system for sending dispute inquiries to cardholders 1 and merchants 2, and a system that accepts incoming communication from merchants 2 and converts the STN 15 received to the PCC 20 for the purpose of facilitating the dispute handling process. More specifically, as shown in FIG. 8, the card provider 3 user interface system 4 provides the cardholder 1 with access to the card provider's transaction services. It is through this interface that the cardholder 1 may register with the card provider 3, may request a STN 15, and, in response thereto, will receive from the card provider 3 a STN 15 that is associated with his PCC 20. The front end 13 system also utilizes at least one application server 5 that processes incoming information, applies the appropriate business rules/condition sets as necessary, and generates appropriate outgoing responses. The application server 5 is configured to support interaction with, inter alia, the user interface system 4 and a STN database 6. An exemplary STN database 6 is a relational database comprising various tables for managing and translating a variety of information, such as cardholder 1 profiles, charge card data, transaction data, merchant data, conditions/rules set profiles, etc. FIG. 9 illustrates two examples of exemplary tables within the STN database 6. STN table 166 may contain a variety of database fields 170 relating to the cardholder's STN account. These fields may contain, in addition to general STN 15 and PCC 20 account information, the business rule/condition set profiles associated with use of the STN 15. A STN Transaction Information Table 168 contains database fields 172 for storing information relating to a particular transaction. As a skilled programmer can appreciate, the processing mechanisms and data structure methods can be structured in a variety of ways. In short, the user interface system 4, application server 5, and the STN database 6 are suitably connected to facilitate the generation and issuance of a STN 15 and are further associated with a card authorization system (CAS) 7, in order to process from the merchant 2 an authorization request involving a STN 15.

[0060] When processing a merchant's request for settlement, i.e., to be paid for a transaction, the financial capture (FINCAP) 10 system receives and captures the financial information (e.g., transaction amount, date, merchant identification (SE) number, STN 15, etc.). The back end application service 8 interfaces with the STN transaction system 18, as necessary, to determine if the number is a valid STN 15 (i.e., not a phony number). If the STN 15 is valid, the AP system 9 pays the merchant 2. The STN database 6 is updated to reflect the transaction information. The STN transaction system 18 (or alternatively the backend application service 8) substitutes the PCC 20 number for the STN 15 and forwards to the AR system 11 for billing.

[0061] Although the present system for facilitating transactions may exist within one card provider system, exemplary embodiments contemplate use with other third party authorization and settlement systems and networks. FIGS. 8 and 11, for example, depict third party authorization networks (FIGS. 11, 91 and 92) and settlement networks (FIGS. 8, 93-95) that may be integrated to form parts and/or processes of the present invention.

[0062] Exemplary processes of the present invention are discussed in greater detail below.

[0063] Registration (FIG. 2, step 100)

[0064] Two exemplary screen shots relating to an exemplary registration process are shown at FIGS. 3 and 4. FIG. 3 depicts a splash page for an American Express® Private Payments℠ program. The Private Paymentss℠ program is an exemplary embodiment of the present invention. Here, a new user 23 may enroll to use the program or an existing user may access a number of program features 25, e.g., review account, request a new STN 15 number or download software. The cardholder 1 generally enters this site by entering an appropriate card provider URL into her browser, by clicking on a link provided by a merchant's website, or alternatively, by an automatic pop-up feature that may appear upon recognizing particular URL or HTML codes.

[0065] To enroll (or register), the cardholder 1 is linked to a registration page (FIG. 4) and prompted for information. Information may include the cardholders name 30, email address 31, card account number 32 (e.g., PCC 20), last four digits of social security number 33, cardholder's date of birth 34, etc. Any suitable authenticating information will suffice. By selecting "continue," the cardholder 1 is provided with a username and password, or preferably, the cardholder is allowed to select her own username and password. The user interface system 4 processes this information and suitably interfaces with the STN transaction system 18 (FIG. 8) to register the cardholder. As one of skill in this art

will appreciate, registration may take many forms and may be accomplished in a variety of ways. For example, a card provider **3** may choose to automatically enroll all new charge card applicants and return to the cardholder a username and password with the physical credit card. Although **FIGS. 3 and 4** show an online registration process, it should be appreciated that this process may take place via any suitable user interface system.

[0066] In one embodiment, during the registration process, the cardholder **1** may choose to select or define various parameters, preferences, and programs to tailor the transaction system to the cardholder's particular needs. Additional embodiments allow the cardholder **1** to select or define parameters, preferences or programs at any point in the transaction process. In other words, the cardholder **1** has the flexibility to select parameters each time (e.g., during registration, log-in, upon STN request, etc.) a STN **15** is generated or may apply universal parameters to every STN **15** generated. With these selections, for example, the cardholder **1** may (i) designate a specific credit card to function as the primary charge card number; (ii) associate the transaction system with other programs such as a non-currency based membership rewards program, an online digital wallet, an online shopping gateway (e.g., American Express's "ShopAMEX"), an online gift check program (e.g. E-Gift), preferred buyer's programs, etc.; (iii) provide password protected access to family members; (iv) activate a smartcard feature allowing remote random generation of secondary transaction numbers; (v) designate cell phone, email or pager numbers to utilize with the voice or automated response secondary transaction number generation feature; (vi) and other banking and transaction features that may be apparent to those skilled in the art. For more information on loyalty systems, transaction systems, electronic commerce systems and digital wallet systems, see, for example, the Shop AMEX™ system as disclosed in Ser. No. 60/230,190 filed Sep. 5, 2000; the MR as Currency™ System disclosed in Ser. No. 60/200,492 filed Apr. 28, 2000 and Ser. No. 60/201,114 filed May 2, 2000; Wireless MR as disclosed in Ser. No. 60/192,197,296 filed on Apr. 14, 2000; a digital wallet system disclosed in U.S. Ser. No. 09/652,899 filed Aug. 31, 2000; a stored value card as disclosed in Ser. No. 09/241,188 filed on Feb. 1, 1999, all of which are herein incorporated by reference.

[0067] Log-in and Request for STN **15** (**FIG. 2**, step **105**):

[0068] A registered cardholder **1** generally accesses the card provider's transaction system by logging into the system via any suitable user interface system **4**. **FIG. 5** depicts an exemplary online log-in screen **130**, where the cardholder **1** is prompted for authenticating information such as a username **132** and password **134**. Alternative systems contemplate authentication via any suitable user interface system. For example, an embodiment employing a portable data device such as a smart card facilitates authentication by swiping the smart card through a smart card reader and providing the appropriate PIN. After entering the appropriate authenticating information and clicking the log in button **135**, the information is routed through the user interface system **4** (e.g., web server) to the application server **5**, where, as shown in **FIG. 5**, the application server **5** retrieves information relating to the cardholder's account from the STN database **6**. If the cardholder **1** has registered multiple charge card accounts, in one embodiment **136**, as depicted in **FIG. 6**, the program prompts the cardholder **1** to choose from a list of accounts from a pull-down menu **138**. The cardholder **1** then selects at least one account to be the primary account or to be included in a primary group of accounts (when it is desired for the STN **15** to be associated with more than one account). In other embodiments, the user interface system **4** (e.g., web server) will return additional options for the cardholder **1**, such as prompting the cardholder **1** to choose from several condition fields such as those previously mentioned (e.g., restricting use to a particular merchant, amount, allowing use by other recipients, etc.).

[0069] STN **15** Generation and Issuance (distribution) to Cardholder **1** (Step **110**):

[0070] An exemplary online transaction process begins with a cardholder **1** desiring to purchase products or services from an online merchant's website. In this exemplary online system, the cardholder **1** selects products from a merchant's online website **2**, is routed or clicks to the merchant's payment page **2***a* (**FIG. 5**). The cardholder **1** is hyperlinked (manually or automatically) to a card provider's web site to log in **130** (**FIG. 5**), which resides on and is managed by the card provider's user interface system **4** (e.g., web server), and, upon logging in, obtains a STN **15** that may then be "cut and pasted,""dragged and dropped" (or alternatively, automatically filled by the card provider **3** or downloaded from a digital wallet) into the payment fields **144**, **146**, **148** (**FIG. 7**) on the payment web page **2***b* (**FIG. 7**). In alternative embodiments, the system includes one or more of the following: the card provider **3** sends the STN **15** directly to the merchant **2**, the STN **15** is encrypted or encoded, the cardholder **1** enters additional security numbers or other indicia or a biometric sample is required from the card provider **3**. In an exemplary embodiment, the STN **15**, as will be discussed next, is generated by the card provider's application server **5** and STN database **6**.

[0071] After authenticating a cardholder **1** during the log-in process, and receiving a request for a STN **15**, the process begins for generating a STN **15**. The user interface system **4** prompts the initiation of the number generation process in the STN transaction system **18**. In an exemplary random number generation process, the STN **15** is generated (preferably immediately) and provided to the cardholder **1** (preferably contemporaneous with the cardholder's request). As previously noted, this allows the number to be usable immediately upon receipt by the cardholder **1** without the need for separate activation (although separate activation features are contemplated by the present invention), while minimizing any increased risk of theft or fraud.

[0072] An exemplary random number generation process is depicted in **FIG. 10**. In this exemplary embodiment, each card provider **3** (**FIG. 1**) is generally identified by a range of numbers on the physical card, typically called the bank identification number (BIN). Each card possesses a product identifier (e.g., first 6 digits. BIN, etc) that is not part of the random number generation process, but in order to initiate the process, this number must first be selected (step **40**). It may be preferable for a card provider **3** to set aside a set of product identification numbers relating to secondary transaction numbers for specific use with the transaction system. Alternatively, however, some card providers may find it desirable to use the same BIN number designation for both

STNS **15** and regular charge card numbers so that one cannot distinguish between the two types of numbers. As depicted in **FIG. 10**, a random eight digit number is generated by the card provider's application server **5** using an algorithmic process (step **41**). The application server **5** verifies that the randomly generated number is available (i.e., it is not in use nor has it been used within a certain period of time) (step **42**). If the transaction number is free (i.e., not in use), a check digit and the selected product identification number is appended to the number (step **43**). This newly created STN **15** is then associated with the cardholder's PCC **20** and is provided to the cardholder **1** (step **45**), whereupon the STN database **6** is updated to reflect that this particular STN **15** is in use and associated with a PCC **20** account. If, during step **42**, it is determined that the number is in use, the number generation process is repeated up to a preset number of times (e.g., 3) (step **44**). After attempting and failing to generate a non-used random number for a preset number of times, a non-used random number is physically selected from the STN database **6** (step **46**).

[0073] After the STN **15** is generated, conditions of use parameters are applied, and are associated with the PCC **20**, the STN **15** is then distributed (i.e., issued) to a cardholder **1** for use in facilitating a transaction. Communication of the STN **15** may occur via a number of use interface systems **4**. For example, **FIG. 7** depicts an exemplary online interface where the STN **15** (Private Payment number) is returned to the cardholder **1**. This embodiment shows how the card provider window **140** overlays a merchant's online payment page **2***b*. The cardholder **1** selects the appropriate charge card (e.g., American Express®) from the credit type filed **144**. The cardholder **1** is then able to "cut and paste" or "drag and drop" the STN **15** (present in the STN field **142**) into the credit card field **146** on the webpage **2***b*. Finally, the cardholder **1** chooses the appropriate expiration date **148** and completes the transaction by selecting the "purchase now" button **150**. Although this embodiment describes linking to a card provider's web site to receive a STN **15**, an additional embodiment configures the user interface **4** (e.g., web server) and STN transaction system **18** to seamlessly interact with the merchant's website to eliminate the need to separately link to the card provider **3**. In this instance, the generation and issuance of the STN **15** would use the merchant **2** as a gateway to the card provider **3**. Any number of interface systems **4** can be used to facilitate the processes described above (**FIG. 2** steps **100**, **105**, **110**).

[0074] For example, as just described, distribution of the STN **15** may occur via a "server to desktop" arrangement where a connection is established between the card provider's web-server **4** and the cardholder's **1** desktop computer, using SSL 3.0. With this exemplary system, the number is generated by the application server **5** (according to an algorithmic processing feature) utilizing a random number generation process such as that previously described and delivered to the web server **4**. The number is then displayed on the cardholder's **1** desktop. While pre-registration is not required, in an exemplary embodiment, a cardholder **1** will have previously registered at the card provider's **3** online web site providing all required personal information, primary charge card account numbers, and establishing a cardholder ID and password (if not already established). The cardholder ID and password are then used for verification of cardholder **1** identity when logging into the card provider's web server **4**.

[0075] Distribution of STNs **15** may also occur via a "server to IVR" arrangement, where a cardholder **1** calls the card provider **3** in order to obtain a STN **15**. In this exemplary embodiment, a voice response menu enables the cardholder **1** to choose the transaction option, and allows the cardholder **1** to enter a main account number. Once identity is verified, a link to the application server **5** is established, prompting generation and delivery of a STN **15** over the phone. In this embodiment, the cardholder **1** provides authenticating information by providing date of birth (DOB), a PIN, etc. Once this verification number is matched to customer's records, the STN **15** is distributed. Of course, this process would also work with a live operator arrangement.

[0076] Additional distribution embodiments include a number of different delivery vehicles and/or portable data devices, such as use of wireless devices, smart chip encoded devices, personal digital assistants (PDAs), pagers, interactive TVs, etc. For example, a "server to wireless device" is used where a wireless phone with internet browser is able to access the card provider's transaction site via the card provider's online service web site. The STN **15** can be delivered via text or voice. Additionally, with the use of encryption keys, the wireless device can be used as payment vehicles (e.g., STN **15** is delivered from the cardholder **1** to merchant **2** or other customer with Blue Tooth or other beaming technology). Again, verification of identity can be accomplished by a variety of means, including cardholder ID and password, DOB, PIN number, SIM cards in phones, etc.

[0077] Another exemplary embodiment of the transaction system, utilizing one or more of the distribution arrangements above, includes situations where a Point of Sale terminal (POS) is not present (e.g., submitting a STN **15** to a merchant **2** such as, for example, a plumber at home). In this exemplary embodiment, the cardholder **1** may not have cash or may not want to provide her PCC **20** number to the vendor due to concerns about unauthorized re-use. As such, the cardholder **1** calls the card provider **3** seeking to obtain a STN **15** with either predefined conditions of use or cardholder determined conditions of use. A voice recognition system asks for a PCC **20** number, the amount she wants to authorize, a merchant ID (e.g., SE number), or any other conditions of use. The voice recognition system communicates with the application server **5** and, alternatively, also CAS **7**, to generate the STN **15**. The STN **15** is then transmitted to the cardholder **1** who in turn provides to the merchant **2**. Additionally, the merchant **2** can also receive, if desired, an immediate call from the voice response unit to provide an approval code. One skilled in the art will appreciate that this system can be used in association with landline phones, cellular phones, pagers, handheld computers or any other PDA devices.

[0078] Another exemplary embodiment of the present invention utilizes a smart card system or similar portable data device to generate and/or distribute a STN **15** to the card provider **1** or merchant **2**. The smart card may facilitate the generation of a STN **15** in a number of different ways. In one embodiment, the smart card device itself generates

the STN **15** from a self-contained processing chip. In another embodiment, the smart card interfaces with the card provider's user interface system **4** to cause the card provider **3** to generate a number. In another embodiment, the smart card supports interaction with a merchant's transaction processing system. "Smart card" is referred to herein to include any microchip enabled transaction card that is capable of being read by a smart card reader, and is also referred herein to generally refer to any portable data device that is capable of processing information. In an online embodiment, the cardholder **1** installs a smart card reader and associated software to be used with the cardholder's computer system that is capable of connecting to the internet. When desiring to make an online purchase, the cardholder **1** swipes or inserts his smart card through a card reader and enters an appropriate PIN. Once properly authenticated, the card provider transaction system generates and issues a STN **15** to the cardholder **1**. In another embodiment, the merchant **2** may have a smart card reader capable of interfacing with the card holder's smart card. In this embodiment, the cardholder **1** swipes or inserts the smart card through the merchant's reader, a PIN is entered and the STN **15** is displayed to the merchant **2**. Additional information relating to smart card and smart card reader payment technology is disclosed in Ser. No. 60/232,040, filed on Sep. 12, 2000, and U.S. Pat. Nos. 5,742,845; 5,898,838 and 5,905,908, owned by Datascape; which are hereby incorporated by reference.

[0079] With an exemplary online smart card embodiment, the cardholder **1** interfaces with the card provider's user interface system **4** (e.g., website) and registers the smart card for use with the transaction system option. The cardholder **1** downloads a program and the program is stored on the cardholder's computer. A STN transaction icon (e.g., Private Payments™ button) appears on the cardholder's browser or an icon appears on the display (e.g., Microsoft Windows® system tray). This button, driven by a card provider specific application (activator) that resides on the cardholder's computer, appears each time the cardholder **1** launches the browser (or alternatively the button appears at any predetermined intervals, cycles or URLS).

[0080] The cardholder **1** suitably links to an online shopping site, orders a product or service or fills a shopping cart and goes to the payment page. The cardholder **1** clicks the STN payments button on the browser or the icon on the display (or the activator automatically launches the STN button) and a pop-up window appears, asking the cardholder **1** to enter the smart card into the smart card reader and, in a preferred embodiment, enter his PIN number. In an alternative embodiment, a PIN may not be necessary. In another embodiment, any other security data or functionality may be included. Upon entering this information, the STN **15** will be generated by the card provider's STN transaction system **18** (**FIG. 8**), or, in another embodiment (discussed below) will be generated directly from the smart card chip; and a pop-up screen containing the STN **15** number will be displayed on the computer. The cardholder **1** then "drags and drops" or "cuts and pastes" the randomly generated STN **15** and other transaction information (e.g., card type, expiration date) into the online order form and completes the transaction. In an alternative embodiment, the STN **15** and other transaction information are automatically filled into the web shopping page by the card provider's web server.

[0081] Another exemplary embodiment of the present invention integrates a smart card with an online merchant's website, which may or may not be utilized by the cardholder **1**. For example, in one aspect of this embodiment the smart card cardholder goes to a merchant website and a "smartchip" payments checkout button appears on the credit card payments page. The card provider's transaction system will be invoked if the card holder **1** checks out via the smartchip payments button. In a preferred embodiment, the transaction system option is "behind the scenes." The cardholder **1** goes to an online shopping site, orders a product or service or fills a shopping cart and goes to checkout page. The cardholder **1** clicks the smartchip payments button on the browser and a pop-up window appears, asking the cardholder **1** to enter the smart card into the smart card reader and, optionally, enter his PIN number. Upon entering this information, the system logs the cardholder **1** into smartchip payments checkout process. The cardholder **1** will hit "check out" and the smartchip payments checkout process may auto-generate and auto-fill the STN **15** and transaction information into the appropriate payment field (an applet may be read off of the smartcard to transfer number to merchant site.) In this embodiment, the STN **15** will be auto-generated off the chip, where the smart card chip may use the Java or Multos operating systems and may use a random number generating algorithm. In one embodiment, the smart card chip is able to access the card provider's transaction system or, alternatively, contain a pool of possible numbers (in order to avoid generating the same number twice). The number is also need sent back to the STN transaction system **18** in order to match the PPC **20** number with the STN **15**.

[0082] In another embodiment using a smart card, a secure electronic transaction (SET) protocol is used to avoid or minimize system/server contact. In this embodiment, the PCC **20** number is on the chip but is encoded. The SET protocol is preferably an encryption algorithm on the chip where part of the initial data would be the cardholder's PCC **20** number. The algorithm could be decoded by the card provider **3** but not by the merchant **2** to come up with the real account number. In one embodiment, the merchant **2** routes the authorization to the card provider via a BIN number rather than the PCC **20** number. When the transaction is sent from the merchant **2** to the card provider **3** for authorization, the CAS **7** preferably triggers the decode algorithm to complete the process, linking the STN **15** to the PCC **20** account.

[0083] Another embodiment contemplates the use of the STN **15** with a transponder system comprising a first means for generating or storing a signal that includes an encoded STN **15** and a second means for reading or receiving the signal. In an exemplary embodiment, a cardholder **1** waves a small transponder unit in front of the merchant's **2** receiving unit. The STN **15** information can be sent/received by a number of known methods (e.g. optical, magnetic, infrared, radio frequency, etc). The merchant **2** reader captures the STN **15** and forwards the STN **15** (with the associated transaction information) to the card provider's CAS **7** as previously described. The transponder units may be set up in a number of ways. Each transponder device may hold one STN **15** with certain predefined parameters or each transponder device may have several STNs **15**.

[0084] STN **15** Authorization Process (**FIG. 2**, step **115**):

[0085] Referencing **FIGS. 1 and 11**, after the secondary transaction number (STN **15**) is provided to the merchant **2**, the merchant **2** submits an authorization request to the card provider **3**, as it would with any other credit card transaction. This request is routed to a card authorization system (CAS) **7** for authorization (step **80**). The CAS **7** recognizes the transaction as involving a STN **15** and forwards the transaction information to the Authorization Request Listener **77** program on the application server **5** (step **81**). The Authorization Request Listener **77** passes the transaction information to a CAS Authentication Component **78** (step **82**). The CAS Authentication Component **78** determines if use of the STN **15** has satisfied the previously defined conditions of use parameters. To determine this, the CAS Authentication component **78** looks to the STN database **6** for the conditions-of-use rules and the primary charge card number (PCC **20**) that are associated with the particular STN **15** (step **83**). If the use of the STN **15** complies with the rules of use, the CAS Authentication component **78** returns an authorization message and the associated PCC **20** to CAS **7** (step **84**). CAS **7** then performs an authorization request for the PPC **20**, as is typically done with any physical charge card, to ensure that the primary charge card conditions (e.g., credit limit, expiration date, etc.) have been met.

[0086] If CAS **7** authorizes use of the PCC **20**, the transaction involving the STN **15** is approved and an approval code will be generated. However, the PCC **20** must first be replaced with the STN **15** and the STN database **6** must be updated to reflect this transaction data. This is accomplished by CAS **7** returning to the CAS Authentication component **78** an approval message with the transaction data (step **85**) and CAS Authentication component **78** forwarding to a reversal processing engine **79** (step **86**). The reversal processing engine **79** interfaces with the STN database **6** to re-substitute the STN **15** for the PCC **20** and also to update the STN database **6** to reflect the transaction information (step **87**). For example, if the conditions of use parameters associated with the STN **15** authorized two transactions, this step **87** updates the cardholder account in the STN database **6** to reflect that only one transaction remains. The reversal engine **79** substitutes the PCC **20** with the STN **15** and forwards to CAS **7** (step **88**). CAS **7** then provides the results to the merchant **2** (step **89**). If the CAS Authentication Component **78** does not authorize use under the STN **15** conditions or if CAS **7** does not authorize use under the PCC **20** conditions, the transaction will not be approved. When the use conditions of both the primary charge card and the secondary transaction numbers are satisfied, the transaction is approved. In this preferred embodiment, however, the STN **15** is not deactivated to prevent settlement. To the contrary, settlement may proceed (as discussed next) even when an authorization was declined.

[0087] Additionally, use of other third party networks and systems are contemplated by the present system. One exemplary system allows a card provider **3** to associate STNs to third party accounts, offering the same fraud reduction benefits to external card issuers. Here, in this exemplary system for authorizing STN, a merchant **2** submits an authorization request to a card provider **3**. CAS **7**, recognizing the STN **15** forwards the request to application server **5**. The conditions of use are checked and the authorization request is modified to substitute the STN **15** with the associated primary account (PCC **20**). In some cases a merchant identifier may be included in the authorization request. Therefore a translation may occur to substitute the card provider **3** merchant ID with the corresponding third party card issuer merchant ID. The request is then returned back to CAS **7** for a normal authorization. CAS **7** then recognizes the account as originating from another issuer (third party issuer **92**), forwards the authorization request to a third party issuer's network for processing (step **84***a*). The network **91** routes the request to the appropriate third party issuer **92** for an authorization determination. The third party issuer **92** processes the authorization request and returns the result to CAS **7** for forwarding back to application server **5** (step **84***b*). Application server **5** saves the authorization result (approval or denial) and substitutes the PCC **20** with the STN **15** and returns to CAS **7** for forwarding to the merchant **2**.

[0088] The authorization and settlement processes may occur as separate steps or as a single step. In one embodiment, referred to herein as an electronic data capture (EDC) system, the merchant **2** sends an authorization request and if the authorization request is approved, a receipt of charges is created and submitted for the merchant **2**. Separate sequences of file transmissions or messages are therefore not required. Various embodiments, hybids, and modifications of these processes should be apparent to one skilled in this art.

[0089] STN **15** Transaction Settlement (**FIG. 2**, step **120**):

[0090] Prior art systems typically deactivate a temporary transaction number during the authorization process if limited-use conditions are not met. As previously explained, because of the uncertainty and variability of the authorization processing, this often results in a transaction numbers being unintentionally deactivated, thereby bringing the transaction processing to a sudden halt. An exemplary embodiment of the present invention overcomes this problem by not "deactivating" the secondary transaction number when predetermined conditions are not met. But instead, allowing the transaction to proceed through settlement, albeit without a valid approval code, where the merchant bears the risk that the amount will later be charged back by the card provider **3** if the transaction is disputed by the cardholder **1**.

[0091] An exemplary settlement process of this invention involves the backend systems shown in **FIG. 8**. Specifically, referencing **FIGS. 1 and 8**, the backend process utilizes a financial capture system (FINCAP) **10** to capture the settlement information (e.g., receipt of charges "ROC" and summary of charges "SOC") from the merchant **2**, a backend application service **8** to ensure that proper account information is processed, an accounts payable system **9** to pay the merchant **2**, and an accounts receivable system **11** to process the account statement that is provided to the cardholder **1**. An exemplary embodiment of the settlement process involves a settlement request being made by a merchant **2** for a transaction involving a STN **15**. All settlement requests are forwarded to the card provider's back end system **14** for processing where the request is initially sent to FINCAP **10**. FINCAP **10** captures the ROC and SOC data and identifies, via the card product identifier (or by any other suitable means), the transaction as involving a STN **15**. In another

embodiment, the product identifier (or BIN number) does not differentiate between a STN **15** and a regular charge card number. In that instance, it will be necessary for FINCAP **10** to call the backend application service **8** (which interfaces with the STN database **6**) to identify the STN **15** from other charge numbers. After the STN **15** is distinguished from the ordinary physical charge cards, FINCAP **10** verifies that the number is valid (i.e., exists in the STN database **6**). If the STN **15** is a valid number, FINCAP **10** creates a payment (accounts payable) file including the transaction data and sends a payment message to the AP system **9** instructing the merchant **2** to be paid. In paying the merchant **2**, the card provider **3** references only the STN **15** and does not release the PCC **20** or any other regular charge card numbers.

[0092] The back-end system **14** processes the cardholder **1** STN account information as follows. After capturing the transaction information (ROC and SOC) from the merchant **2**, FINCAP **10** creates a cardholder account (accounts receivable) file and sends a message to the back-end application service **8** to process the information for cardholder billing. Recognizing that the transaction involves a STN **15**, the back-end application service **8** replaces the STN **15** with the PCC **20**, updates the cardholder STN account information in the STN database **6** to reflect the appropriate transaction settlement information, and processes the transaction as with any other transaction. The backend application service **8** sends the transaction details to the AR system **11**, where the AR system **11** sends the proper statement to the cardholder **1**, typically referencing only the PCC **20** number. In another embodiment, the AR system **11** may process the statement where the transactions are further categorized and itemized by both the PCC **20** number and the STN **15**.

[0093] As previously noted, it may often be the case with prior art systems, that the temporary transaction number is inadvertently deactivated during the authorization phase and completion of the transaction is not possible. e.g., multiple payment purchases. The present transaction system overcomes this problem by ensuring that valid transaction numbers will be processed. If the conditions-of-use parameters are not met, the cardholder **1** is, under an exemplary embodiment of the present system, able to dispute the transaction and have the transaction charged back to the merchant **2** during the dispute handling process (discussed next). During this dispute handling phase, the card provider **3** will retrieve information from the STN database **6** to determine if the disputed information was "authorized", i.e., has an associated approval code. If the transaction was not "authorized" because the conditions of use parameters were not satisfied, the amount will be charged back to the merchant **2** according to predefined business rules.

[0094] Another embodiment provides for checking the approval codes and other conditions during settlement. Here, transaction information (approval code, SE number, or other information) may be checked during settlement. For example, the backend application service **8** (or the application server **5**) may compare transaction information to a business rule or conditions set associated with a cardholder **1** STN account. If conditions of use have not been met or if a valid approval code is missing, the service **8** or server **5** may cause a charge back to be issued to the merchant to offset the previous merchant payment. In other words, in this alternative embodiment, where an STN **15** transaction is processed through settlement, the following events may occur in sequence. First, a payment file is established once it is determined that the STN **15** is a valid number. Second, the merchant is paid. Third, the system applies the business rules or conditions for the particular account associated with the STN **15**. Fourth, if it is determined that the merchant **2** should not have been paid in the first instance because the transaction conditions were not met or an approval code was not present, the system will execute a charge back to the merchant **2**. This settlement processing may be transparent to the cardholder **1** since, before the AR system releases a cardholder billing statement, the merchant is paid and then charged-back resulting in no outstanding balance to the cardholder **1**.

[0095] As shown in **FIG. 8**, the present invention contemplates the interaction of clearing and settlement systems other than those of the card provider **3**. This exemplary system allows a card provider **3** to clear and settle STN transactions where an STN **15** is associated to a third party account, meaning that the merchant **2** is paid and the charge is billed to the cardholder **1**. As such, an exemplary embodiment of the present invention is configured to support interaction with third party networks and systems. Here, the backend application service **8**, upon receiving a STN **15**, recognizes that the associated PCC **20** originated with another card issuer **92**. The backend service **8** separates the transaction into two transactions (a clearing transaction and a settlement transaction). A substitution occurs in the clearing transaction where the STN **15** is replaced by the associated PCC **20**. Also, a translation may occur to substitute the card provider **3** merchant ID with the corresponding third party card issuer ID. The transactions are then forwarded to a third party clearing and settlement network **93**. The third party clearing and settlement network **93** handles the routing, as appropriate, to a merchant acquirer's accounts payable system **91** and an issuer's accounts receivable system **92**. As noted above, the accounts payable system ensures that all correspondence with the merchant **2** references the STN **15**.

[0096] Dispute Handling and Customer Service Process (step **125**):

[0097] The dispute handling process of the present invention involves situations where a cardholder **1** or merchant **2** disputes charge that is associated with a transaction involving a STN **15**. Generally, a cardholder **1** disputes a charge by contacting the charge card provider **3** via phone, mail, or internet. As previously noted, an exemplary AR system **11** typically bills the cardholder **1** with reference to only the PCC **20** number. The computer systems of the present invention allow the card provider's customer service representatives to lookup information based on, inter alia, the STN **15** or the PCC **20** number. **FIG. 12** depicts an exemplary look-up screen **175** for reviewing the primary charge card account **20** and the transactions associated with the STNs **15**.

[0098] With respect to a cardholder initiated dispute, the representative initiates a dispute through a dispute handling system (DHS) to obtain the case avoidance or case set rules for cardholder disputed transactions. One of the case avoidance or case set rules provides for a look up from the STN database **6** to verify that the transaction was processed with an approval code. The rule set may provide for, inter alia, an automatic charge back of the transaction amount to the

merchant if an STN **15** transaction is submitted without an approval code. The DHS or the representative initiates a cardholder **1** or merchant **2** contact (via phone, mail, internet). Disputes involving STNs **15** may be automatically routed to predefined STN queues based on industry type (i.e., airline, car rental, etc). Contact letters may be automatically filled with information retrieved from the STN database **6**. The adjustment file accesses the application server **5** (or backend application service **8**) to substitute the PCC **20** number with the STN **15**. A letter file is then generated and an electronic transmission system routes electronic contacts to and from various merchant interfaces.

[0099] In an exemplary system for handling disputes from merchant **2**, a merchant **2** contacts the card provider **3** via normal channels. The card provider's representative generally accesses a customer service application that is used to service merchants. This customer service application identifies the account by a STN **15** in dispute. A case is set-up with the STN **15** and is managed via adjustment management systems. The adjustment management system and a letter generating system access the STN transaction system **18** for the account number swap, where the PCC **20** number is replaced with the STN **15** for financial adjustments intended for the cardholder **1**. The remaining inquiry is processed as with existing dispute handling systems.

[0100] Although the previously described embodiments generally relate to a cardholder's **1** request for a STN **15**, the merchant **2** may also find it desirable to request secondary transaction numbers from the card provider **3** in order to limit exposure to credit card fraud. In traditional transaction processes, upon completing a transaction, the merchant **2** stores transaction information (including the customer's credit card number) in a merchant database. This database of information is subject to credit card fraud in that a thief could hack into the merchant's computers to steal its customer's credit card numbers. To limit exposure, the merchant **2** may desire to replace those customer credit card numbers with STNs **15** that are associated with the cardholder's primary credit card number (e.g., PCC **20**), i.e., the merchant may not want its database filled with actual customer credit card numbers. In this situation, only the card provider **3** maintains the actual credit card number and the merchant **2** retains only the STN **15**. In an exemplary process, the merchant **2** receives a regular credit card number from a cardholder **1** to facilitate a transaction. The merchant **2** submits the number to a card provider **3** for authorization, requesting that the card provider **3** instead of returning the regular credit card number, return a STN **15** (and approval code) that is associated with the regular credit card. In response, the card provider generates a STN **15**, associates the number to the regular credit card number (which becomes the primary account (e.g., PCC **20**)), checks to see if authorization is appropriate and returns the authorization record (only referencing the STN **15**) to the merchant **2**. The merchant **2** processes the transaction through the normal settlement channels, referencing the STN **15** instead of the regular credit card number. When retaining transaction records, the merchant **2** replaces the primary credit card number with the STN **15** and maintains the STN **15** in its database.

[0101] In another embodiment, the merchant **2** accepts only STNs **15**—not regular credit card numbers—from cardholders to complete transactions. For the same reasons stated above, the merchant **2** may desire to limit receipt of regular charge card numbers to limit exposure to credit card fraud. In one exemplary embodiment, the merchant **2** computer system differentiates between STNs and regular charge card numbers and will not allow customers to use regular charge card numbers to facilitate a transaction (i.e., will refuse the transaction). As previously described, however, the STN **15** and the regular charge card may be transparent to the merchant **2** making it difficult for the merchant **2** to differentiate between the STN **15** and the regular charge card. In this situation, in an exemplary embodiment, the STN **15** will be identified during the authorization process by the card provider **3**, where if the STN **15** does not meet certain conditions defined by the merchant **2**, the transaction will not be authorized. For example, the merchant could require that all customer transactions be completed with a STN **15** that has limited-use conditions restricting use to the amount of the transaction or restricting use to the particular merchant. During the authorization process, the STN **15** is compared with the merchant-defined conditions where if the conditions are not satisfied, the authorization request will be denied. After completion of the transaction, and upon satisfying the merchant **2** conditions, the STNs **15** have little to no value and would be of minimal value to a potential thief.

[0102] Several additional embodiments of the transaction system are provided below.

[0103] In one embodiment, the STN database **6** is used to facilitate the merging of a newly acquired cardholder base with an established cardholder base. For example, when a bank or other institution sells a cardholder base to a card provider **3**, the card provider **3** creates new physical accounts for the acquired cardholders and does not issue new cards. The STN database **6** is updated to associate the acquired cardholder account numbers to the newly created accounts. This allows the cardholders' existing physical cards to still be used and processed appropriately. The card provider (BIN) routing is modified for the acquired accounts so authorization requests and settlements are sent to the card provider **3** instead of to the bank or other institution. CAS **7** and FINCAP **10** recognize these acquired accounts as STN **15** accounts and translate the numbers appropriately. The end result is that charges made by the acquired cardholders end up on a statement generated by the card provider **3**.

[0104] In another exemplary embodiment of the transaction system, a card provider **3** may provide a line of credit to a customer or to a merchant **2** or group of merchants who can private label for use by their customers. This allows the merchant **2** to provide a branded line of credit with minimal or no changes to the credit card authorization and settlement process. In one embodiment, the merchant **2** approves a line of credit or asks the card provider **3** to approve a line of credit for the customer. The card provider would then issue a STN **15** to the customer via the merchant **2**. This STN **15** is generally used with the merchants **2** who are issuing the line of credit. When the customer wants to make a purchase using the merchant's line of credit, the merchant forwards a standard credit request to the card provider **3** with the STN **15** used as the credit card number in the transaction protocol. The card provider **3** verifies that the line of credit is authorized and was submitted by the merchant **2** issuing the line of credit associated with this STN **15**. The card provider transaction system (via the STN transaction system **18**) is capable of denying usage of this line of credit at another

non-participating site. The card provider **3** may provide a private label or co-branded web site to apply for the line of credit. The card provider's back end system **14** then bills the customer and pays the merchant. The merchant **2** may keep the electronic line of credit privately at their site, or provide it to the customer. The authorization system would not authorize usage at other sites.

[0105] **FIG. 13** depicts an exemplary transaction process for use in providing lines of credit to merchants **2**. A cardholder **1** or customer (who may or may not be an existing card member of the participating card provider **3**) applies for an electronic line of credit (ELOC) with a merchant **2** (step **221**), the merchant **2** redirects the cardholder **1** to the card provider's **3** website to fill out the ELOC application **30** (step **222**). A fraud check **31** is performed (step **223**) and a credit inquiry is typically performed by any credit bureau company **33** (step **224**). If a card processing system **32** determines that credit is acceptable, an account is set up (step **225**). A physical card **34** is not generated as with typical processes and may need to be purged depending on the particular system set-up (step **226**). The account is sent to the account management system **35** (step **227**) and then forwarded to the STN database **6** and the application server **5** (step **228**). The cardholder **1** account is then related to a valid merchant identification number such as the SE number **36** (step **229**). An account is then set-up with a ELOC profile **37** and at this point the secondary transaction ELOC number is passed back to the cardholder **1** (step **230**). The merchant **2** submits the ELOC payment request to CAS **7** (step **231**), and CAS **7** routes the ELOC to the STN system (step **232**), where the STN system verifies that the SE number is approved for this particular ELOC (step **233**). The STN system translates the ELOC STN to the related account in the account management system and returns the ELOC STN to merchant (step **234**). The merchant is then required to submit the authorization code with the receipt of charges (ROC) and summary of charges (SOC). The merchant submits the ROC and/or SOC to the card provider's FINCAP **10** (step **235**), whereupon FINCAP forwards the ELOC to the STN system (step **236**). The STN system verifies that (i) this SE number is valid for the particular ELOC account (step **237**) and (ii) the particular transaction was authorized for the specific ELOC account (step **238**). The STN system then flips the card number, returns it to FINCAP **10**, whereupon, the number is forwarded to the card provider's accounts receivable system **11** (step **239**). FINCAP forwards the ELOC STN and associated information to the Accounts Payable system **9** (step **240**) and pays the merchant **2** (step **241**).

[0106] Another exemplary embodiment allows a cardholder to fund an online digital wallet with the secondary transaction number. In this embodiment, after generation and association with the primary charge card, the secondary transaction number is provided to the cardholder to use within a designated digital wallet, which may reside locally at the cardholder's computer or may be stored in an online password protected account.

[0107] In yet another alternative embodiment, the secondary transaction system may be used to facilitate programs involving non-currency tender, such as the American Express® Membership Rewards as Currency™ system that is detailed in U.S. Provisional Application No. 60/200,492, filed on Apr. 28, 2000, and U.S. Provisional Application No. 60/201,114, filed on May 2, 2000, which are hereby incorporated by reference. One embodiment of this system, depicted in **FIG. 14**, allows a cardholder **1** to create a STN **15** to be used to spend membership rewards points. In general, a membership or incentive rewards program is a loyalty program that rewards cardholders for using their charge card to make purchases. Cardholders accumulate points by using a participating charge card or by purchasing products at a participating merchant. These points may then be converted to a monetary value and redeemed to purchase merchandise.

[0108] As depicted in **FIG. 14**, a cardholder **1** accesses and logs onto the card provider's services via a user interface system **4** (e.g., an internet connection) (step **251**). The cardholder **1** proceeds (clicks on hyperlink) to the membership rewards (MR) system **95**, where she indicates that she would like to use her membership reward points that are available in her MR account (step **252**). The MR system **95** reports to the cardholder **1** how much the available MR points are worth (step **253**). The cardholder **1** indicates how many of the MR points (converted to monetary value) should be loaded into an account that can be used for purchases (step **254**). In an exemplary embodiment, the STN **15** can be associated with a MR account, i.e., a primary charge card account that is funded with these MR points. Use of this MR account may be limited by the card holder **1** or the card provider **3**, or could be further limited by the MR system rules of use that may have been predefined by participating merchants (step **255**). Once the MR system **95** has approved the request and allocated the requested MR points, the STN system **18** associates a STN **15** and establishes an MR-STN **15** profile (**256**). The MR-STN profile contains the options that will be applied and the amount that will be available to the resulting STN **15**. The STN system **18** returns the STN **15** (and other account information) to the MR system **95** to provide to the cardholder **1** for use in completing subsequent transactions (e.g., online purchases) (step **257**).

[0109] When desiring to purchase products using the MR point-funded STN **15**, the cardholder **1** proceeds to a merchant site (e.g., online website), selects goods and is requested by the merchant to provide payment information (e.g., via an online payment web page). The cardholder **1** chooses the appropriate card provider **3** as the form of payment (e.g., American Express®, Visa®, etc.) and enters the STN **15** (and other needed information) into the appropriate payment fields (step **258**). The merchant processes the STN **15** authorization as discussed above (step **259**), where the card provider CAS **7** recognizes the transaction as involving a STN **15**, and forwards the request to the STN system **18** containing, inter alia, an application server (**FIG. 8**, number **5**) and a STN database (**FIG. 8**, number **6**). It should be appreciated that profile information may be stored in a MR database, STN database **6** or any other suitable database (step **260**). The STN system **18** recognizes the account as a MR account, and verifies that optional conditions, if any, are met. If the conditions are not met, an error is returned to CAS **7** and then to the merchant (step **261**). If the conditions are met, the balance available on the MR-STN profile is reduced by the purchase amount, a record of the purchase is recorded in the MR-STN profile, and an approval code is returned to the authorization system (step **262**) and then to the merchant (step **263**). Although additional CAS **7** processing is contemplated by this embodi-

ment, application of additional rules and validations—which would typically be applied—are not required for this type of account. The approved purchase is finalized by the merchant with the STN **15** transaction being submitted through the merchant's existing POS network for settlement (step **264**). The STN **15** transaction is received by the card provider's financial capture system (FINCAP) **10** (step **265**). The FINCAP **10** forwards the STN transaction to the appropriate AP system **9** (step **266**). The AP system **9** then pays the merchant according to the appropriate settlement terms and conditions (step **267**). The FINCAP **10**, having identified the transaction as involving an STN **15**, sends the transaction information to the STN system **18** (via a backend application service **8**) to identify the actual account number (i.e, PCC **20**) (step **268**). The STN system **18** recognizes that the STN **15** is associated with a MR account, searches for the MR-STN profile and passes a credit request to the appropriate cardholder **1** MR account to reduce the available MR points (step **269**), and (ii) the transaction record is used to build a credit against the actual charge card account (e.g., PCC **20**) that will offset the charged STN **15** transaction (step **269***b*). In the first instance (step **269**), the STN system **18** passes a request to the MR system **95** to deduct the appropriate number of MR points. In the second instance (step **269***b*), both the original transaction and the credit are passed back to FINCAP **10** with the actual charge card account number (e.g., PCC **20** number). The FINCAP **10** then forwards the charge and credit transactions to the appropriate AR system **11** for normal billing processing.

[0110] As shown, the embodiment depicted in **FIG. 14** allows the cardholder **1** to spend the MR points in at least two ways. First, the membership reward points can be deducted at the time of the transaction processing, or second, the transaction can be reflected on the cardholder's bill along with an associated credit that reflects the payment with reward points. It should also be appreciated that a cardholder **1** may choose to use MR points on a transaction by transaction basis, and preferably, is able to combine variations of currency (e.g., credit, debit cards etc.) and non-currency tender (MR points), as desired, to effectuate a transaction. Additionally, both currency and non-currency tender may be integrated into a STN gift, where a first party gifts to a second party a secondary transaction number that has some currency or non-currency value.

[0111] Another membership rewards embodiment is shown in **FIG. 15**. Here, the cardholder **1** is able to choose to use membership reward points when shopping at a merchant **2** site that supports the membership rewards as a payment option. Referencing **FIG. 15**, the cardholder **1** goes to a participating merchant's site (e.g., online website) to shop for goods or services. The cardholder **1** selects merchandise and continues to a payment site, where the card provider's MR points is one of the payment options (step **301**). When the cardholder selects this option, a secure connection is established with the card provider **3** that authenticates both the cardholder **1** and the merchant **2** (step **302**). The card provider **3** requests the cardholder's user ID and Password, either through a pop up screen, a http redirect link, or an applet downloaded by the merchant (step **303**). The cardholder **1** supplies the User ID and Password which is returned to the card provider with the purchase amount (step **304**). The card provider user interface **4** (e.g., online services) causes the cardholder **1** to be authenticated, collects the associated registered card accounts and invokes the MR system **95** (step **305**). The MR system **95** uses these card accounts to identify the cardholder's MR account (step **306**). If none of the registered accounts are related to a MR account, the cardholder **1** is not able to use MR points to pay for her purchase and an error is returned to the cardholder **1**. After identifying the MR account, the MR points available are converted to the corresponding cash equivalent and compared to the purchase amount being requested. If the purchase amount is greater than the MR cash equivalent, an error is returned to the cardholder **1** (step **307**). If the MR cash equivalent is greater than the purchase amount, all card accounts participating in the MR account are collected and returned to the cardholder **1** (step **308**). The cardholder **1** designates the card account to be used to house all succeeding financial activity, which is then returned to the card provider **3** (step **309**). The card provider **3** then triggers the STN system **18** to establish a STN **15** that is associated to the selected MR account number and a MR-STN account profile is set-up (step **310**). The STN system **18** returns the STN **15** to the User Interface System **4** and then onto the cardholder **1** (step **311**), The cardholder **1** cuts and pastes, drags and drops, or auto-fills the STN **15** (and needed information) nto the appropriate merchant payment field (step **312**).

[0112] As previously noted, the merchant uses the existing authorization network to request authorization for the STN transaction (step **313**). The CAS **7** recognizes the transaction as one involving a STN **15** and forwards to the STN system **18** (step **314**). The STN system **18** identifies the associated actual account number (e.g., PCC **20** number) for the STN **15** (step **315**) and also recognizes the account as a MR account. At this point, although all MR transactions would have been previously verified, the MR account balance is again checked to minimize possible fraud (e.g., fraud involving two requests using the same MR points). The cash equivalent for the MR points for the actual account are then retrieved from the MR system **95** and if the purchase amount is greater than the available amount, a denial is returned to the authorization system and to the merchant **2** (step **316**). If the cash equivalent value of the MR points exceeds the purchase amount, the STN system records the purchase in the MR-STN profile and returns the STN **15** to the CAS **7** (step **317**). The CAS **7** then completes the authorization for the actual account (e.g., ensuring that the limits for the PCC **20** are complied with) (step **318**), and returns the results (e.g., approval code) to the merchant **2** (step **319**).

[0113] The approved transaction is finalized by the merchant **2** with the STN transaction being submitted through the existing point of sale network for settlement (step **320**). As before, the transaction information is received by the card provider FINCAP **10** (step **321**) and then forwarded to the appropriate AP system **9** (step **322**) for payment (step **323**). Since the transaction involves a STN **15**, FINCAP **10** directs the transaction to the STN system **18** to identify the PCC **20** (step **324**). The STN system **18** identifies the PCC**20** (step **325**) and also recognizes the STN **15** account is set up using MR points, where the STN system **18** searches the MR-STN profile for the associated purchase record (step **326**). The STN system either (i) passes a credit request to MR to reduce the MR points (step **326***a*), or (ii) creates a credit against the billing transaction (step **326***b*). In step **326***a*, the STN system **18** passes a request to the MR system **95** to deduct the appropriate number of MR points. Here it is not necessary to return the AR transaction information to FINCAP for forwarding to the AR system **11**, but a recon-

ciliation entry is created to reconcile the AR for FINCAP **10**. In step **326***b*, a transaction record is used to build a credit against a real account number (e.g., PCC **20**) that will offset the charge transaction. The STN system **18** forwards this credit to the FINCAP **10**. The original billing transaction is returned to the FINCAP to appear on the cardholder's **1** statement. The FINCAP **10** then forwards the charge transaction to the appropriate AR system for normal processing. The FINCAP **10** forwards the credit issued by the MR system **95** to the appropriate AR system **11** for normal billing processing. Accordingly, the cardholder **1** will see on her statement a credit reflecting the currency value of the MR points used and a charge in the amount of the transaction.

[**0114**] Another embodiment provides for the generation of one or more STNs that are subordinate to and associated with a main secondary transaction number that, as described above, is associated with the cardholder's PCC **20** account. As noted above, these subordinate numbers may also be digitally stored in devices such as wireless telephones, PDAs, handheld computers, and the like. Providing multiple layers of secondary transaction number provides the cardholder **1** with greater flexibility. For example, a cardholder on vacation could structure the main STN **15** to be valid for the duration of the vacation. The cardholder **1** is then able to generate subordinate secondary transaction numbers (or tertiary numbers) with varying preferences to take into account various activities that may occur during the vacation. A cardholder **1** could structure the main secondary transaction number to have a maximum credit limit of $3,000 (this assumes that the associated primary charge card credit limit is equal to or greater than $3,000) that is good for the duration of the vacation. A subordinate secondary transaction number may then be provided to the spouse with a $1,000 limit and additional secondary transaction numbers, restricted to $500 limits, could be provided to the children. Each subordinate card would be valid only for the duration of the vacation and would only be valid for the maximum dollar amount specified.

What is claimed is:

1. A method for facilitating a transaction, comprising the steps of:

identifying at least one primary account;

generating a secondary transaction number that is configured to facilitate a transaction;

associating the secondary transaction number with said at least one primary account; and

issuing the secondary transaction number to a first party to facilitate a transaction with a second party, wherein the secondary transaction number is configured to be immediately usable for facilitating the transaction.

2. The method of claim 1, wherein the step of identifying said at least one primary account further comprises the steps of receiving information from the first party specifying a particular account; and verifying that the account exists and is valid.

3. The method of claim 1, wherein the step of generating a secondary transaction number further comprises the steps of:

generating a random number;

determining if the random number is available for use; and if available for use,

appending appropriate formatting and product identifier numbers to the random number to achieve a secondary transaction number that is configured to have the same format as the primary account number.

4. The method of claims **1** or **3**, wherein the secondary transaction number is generated by a computer system.

5. The method of claims 1 or **3**, wherein a portable data device is configured to generate the secondary transaction number.

6. The method of claims **1** or **3**, wherein a portable data device is configured to support interaction with a card provider's user interface system to generate the secondary transaction number.

7. The method of claim 5, wherein a portable data device reader is configured to support interaction with the portable data device.

8. The method of claim 1 or 3, wherein the secondary transaction number is generated by a first party's computer system configured to support interaction with a card provider's user interface system.

9. The method of claim 1, wherein the step of associating the secondary transaction number with the primary account further comprises the step of recording the secondary transaction number in a database associated with the primary account.

10. The method of claim 1, wherein the primary account is associated with a physical charge card.

11. The method of claim 1, wherein the step of issuing the secondary transaction number to a first party is facilitated by a user interface system.

12. The method of claim 11, wherein the user interface system comprises at least one of the following: a web server system, a telephone system, and a mail handling system.

13. The method of claim 1, further comprising the steps of registering a first party to use a transaction system configured to generate and issue a secondary transaction number; and upon proper registration, providing the first party with authentication information;

14. The method of claim 13, where the authentication information is a username and password.

15. The method of claim 1, further comprising the steps of:

prompting the first party for authentication information to confirm that the first party is a registered user; and

receiving authenticating information from the first party, and upon verifying that the first party is registered, providing the first party access to a transaction system.

16. The method of claim 15, further comprising the step of receiving a request from the first party for a secondary transaction number.

17. The method of claim 1, further comprising the steps of:

allowing the first party to select and define conditions-of-use parameters, wherein the parameters place limits on how the secondary transaction number may be used; and

associating the conditions-of-use parameters with the secondary transaction number.

18. The method of claim 17, further comprising the step of storing the condition of use parameters in one or more account database fields associated with the secondary transaction number.

19. The method of claim 17, wherein the conditions of use parameters comprise at least a secondary transaction number credit limit and an expiration date.

20. The method of claim 1, comprising the following steps:

receiving transaction information from a second party for authorization;

forwarding the transaction information to a card authorization system for authorization processing;

processing the transaction information with the card authorization system, wherein the card authorization system interfaces with a secondary transaction number system to determine if authorization is appropriate.

21. The method of claim 20, further comprising the steps of:

recognizing that the transaction information comprises a secondary transaction number;

retrieving account information that is associated with the secondary transaction number;

determining if conditions of use associated with the primary account are satisfied;

determining if conditions of use associated with the secondary transaction number are satisfied;

returning an appropriate approval code to the second party, if conditions of use parameters associated with the secondary transaction number and the primary account are satisfied; and,

declining the authorization request if either the conditions associated with the primary account or the secondary transaction number are not satisfied.

22. The method of 21, wherein the conditions of use parameters associated with the primary account include at least an expiration date.

23. The method of claim 1, comprising the following steps:

receiving transaction settlement information from a second party, wherein the transaction was facilitated using a secondary transaction number;

identifying the transaction settlement information as a transaction involving a secondary transaction number; and verifying that the secondary transaction number is a valid number;

capturing the transaction settlement information in a financial capture system, and causing the second party to be paid.

24. The method of claim 23, further comprising the steps of:

identifying the primary account that is associated with the secondary transaction number;

replacing the secondary transaction number with the primary account number;

processing the transaction settlement information in an accounts receivable system; and

generating a billing statement that includes at least the primary account number.

25. The method of claim 24, further comprising the steps of comparing the transaction settlement information with conditions of use parameters associated with the secondary transaction number to determine if the conditions of use have been satisfied.

26. The method of claim 1, further comprising the step of configuring the secondary transaction number for use with an electronic line of credit system.

27. The method of claim 1, further comprising the step of configuring the secondary transaction number for use with a stored value card system.

28. The method of claim 1, further comprising the step of configuring the secondary transaction number for use with a non-currency based account program.

29. The method of claim 1, further comprising the step of configuring the secondary transaction number to be used as a gift product.

30. The method of claim 1, further comprising the step of configuring the secondary transaction number to be used in an online wallet system.

31. A method of processing authorization and settlement requests in a transaction system comprising the steps of:

receiving an authorization request from a second party, where the authorization request involves a secondary transaction number with limited-use conditions associated therewith;

routing the authorization request to a card authorization system to determine if limited use conditions have been satisfied;

returning to the second party a message declining authorization if the conditions have not been satisfied; and

returning to the second party a message approving authorization request if conditions have been satisfied.

32. The method of claim 31, further comprising the step of receiving from the second party a settlement request for payment of a transaction involving a secondary transaction number; wherein the second party is paid if the secondary transaction number is valid.

33. A method of claim 32 further comprising the steps of:

routing the second party settlement request for payment to a financial capture system,

creating an accounts payable file and routing the accounts payable file to an accounts payable system for payment processing; and

creating an accounts receivable file and routing the accounts receivable file to a service that retrieves the associated primary account number and replaces the secondary transaction number with the primary account number and forwards the resulting accounts receivable file to an accounts receivable system to generate the first party billing statement.

34. A host computer system for facilitating transactions comprising:

a user interface system configured to allow a first party to interact with a host computer's transaction services; and

a number generating and processing mechanism, including at least one application server and at least one

database, configured for receiving input from the user interface system to generate a secondary transaction number and to associate therewith a designated primary account.

35. The host computer system in claim 34, further comprising a card authorization processing mechanism configured to receive transaction information from a second party, wherein the authorization mechanism interfaces with at least the number generating and processing mechanism to determine if the second party authorization request should be approved or denied.

36. The host computer system in claim 34 or 35, further comprising a settlement processing mechanism including at least a financial capture system configured for capturing transaction information relating to use of secondary transaction numbers, an accounts receivable system for billing the first party and an accounts payable system for paying the second party.

37. The system of claim 34, wherein the user interface system comprises at least one of the following: web server system, telephone system, and mail handling system.

38. A method for facilitating a transaction comprising the steps of:

registering with a card provider to use a transaction system;

logging-in to the card provider's transaction system by providing authenticating information, and causing card provider to verify that a first party is a registered and authorized user;

designating at least one transaction account as at least one primary account;

requesting a secondary transaction number from the card provider, causing the card provider to generate a secondary transaction number and to associate the secondary transaction number with the previously selected said at least one primary account; and,

receiving the secondary transaction number from the card provider.

39. The method of claim 38, further comprising the step of providing the secondary transaction number to a second party to facilitate a transaction.

40. The method of claim 38, further comprising the step of selecting conditions of use parameters to be associated with the secondary transaction number.

41. The method of claim 38, further comprising the step of defining conditions of use parameters to be associated with the secondary transaction number.

42. The method of claim 38, wherein the steps occur online.

43. The method of claim 38, wherein said at least one primary account is a non-currency based account.

44. The method of claim 38, wherein said at least one primary account is associated with an electronic line of credit system.

45. The method of claim 39, further comprising the step of disputing a charge for a transaction involving a secondary transaction number, and causing the card provider to charge back the charge to the second party.

46. A method for facilitating a non-currency based transaction system involving a secondary transaction number comprising the steps of:

designating a non-currency based account as at least one primary account;

generating a secondary transaction number and associating said secondary transaction number with at least one primary account, wherein said at least one primary account includes at least the designated non-currency based account;

converting accumulated non-currency based tender into currency to fund the primary account.

47. The method of claim 46 further comprising the step of designating condition of use parameters and associating said parameters to the secondary transaction number.

48. The method of claim 47 further comprising the step of processing an authorization request from a second party relating to a transaction involving a secondary transaction number associated with at least a non-currency based account comprising the further steps of:

recognizing the transaction as involving a non-currency based account;

verifying the conditions of use have been satisfied; and if satisfied,

reducing the non-currency based account balance by the transaction amount.

49. The method of claim 47 further comprising the step of processing a transaction settlement request from a second party relating to a transaction involving a secondary transaction number associated with at least a non-currency based account further comprising the steps of:

capturing transaction settlement information in a financial capture system, wherein an accounts payable file is created and the second party is paid.

forwarding the transaction settlement information to an accounts receivable system;

recognizing that the transaction settlement information comprises a secondary transaction number that is associated with at least a non-currency based account;

issuing a credit equal to the transaction charge amount from the non-currency based account to the accounts receivable system; wherein the credit from the non-currency based account offsets at least part of the transaction charge.

50. A method for facilitating an electronic line of credit system involving a secondary transaction number comprising the following steps:

issuing a line of credit to a participating first or second party;

causing to be processed an application from the first party requesting to be issued a secondary transaction number;

causing to be issued to the first party a secondary transaction number that is associated with the line of credit; wherein the secondary number is used to facilitate a transaction.

51. The method of claim 50 further comprising the steps of:

providing the secondary transaction number to a first party, wherein the secondary transaction number may only be used with a specified second party to facilitate a transaction.

52. A dispute handling method for facilitating a disputed transaction involving a

secondary transaction number, comprising the steps of:

receiving a dispute from a first party relating to a transaction involving a secondary transaction number associated with at least one primary account;

retrieving transaction information from a database;

replacing the primary account number with the secondary transaction number in order to initiate a second party inquiry; wherein the second party inquiry references only the secondary transaction number.

53. The method of claim 52, further comprising the steps of:

determining if a valid approval code is associated with the secondary transaction number; and

charging back to the second party the amount of the transaction, if a valid approval code does not exist.

54. A method for facilitating a transaction, comprising the steps of:

receiving a primary account number from a first party to initiate a transaction;

sending the primary account number to a card provider, requesting that the card provider generate and return a secondary transaction number that is associated with the primary account number;

receiving from the card provider the secondary transaction number associated with the primary account, wherein the secondary number is then used to facilitate a transaction settlement.

55. A method of claim 54, wherein the step of sending the primary account number to a card provider occurs during a card authorization process.

56. A method of claim 54, further comprising the step of purging the primary account number from the second party's records and replacing with the associated secondary transaction number.

* * * * *

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United States Patent [19]

Nguyen et al.

[11] Patent Number: 5,978,840

[45] Date of Patent: Nov. 2, 1999

[54] **SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR A PAYMENT GATEWAY SYSTEM ARCHITECTURE FOR PROCESSING ENCRYPTED PAYMENT TRANSACTIONS UTILIZING A MULTICHANNEL, EXTENSIBLE, FLEXIBLE ARCHITECTURE**

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[73] Assignee: **VeriFone, Inc.**, Santa Clara, Calif.

[21] Appl. No.: **08/721,133**

[22] Filed: **Sep. 26, 1996**

[51] **Int. Cl.**[6] **G06F 13/00**

[52] **U.S. Cl.** **709/217**; 380/23

[58] **Field of Search** 380/23, 24; 709/203, 709/217, 219

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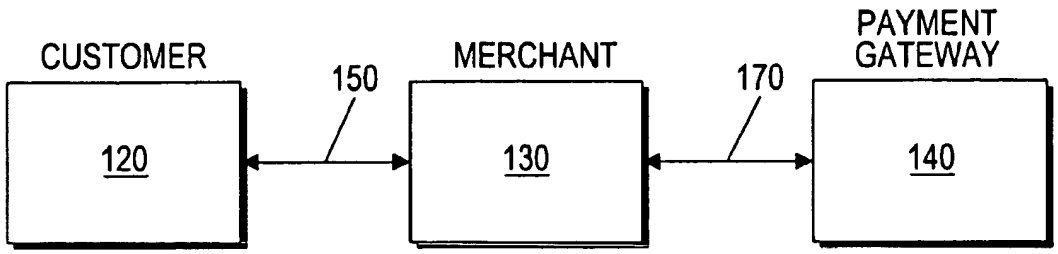
Primary Examiner—Moustafa M. Meky

Attorney, Agent, or Firm—Sanford E. Warren, Jr.; Daniel J. Chalker; Gardere & Wynne, L.L.P.

[57] **ABSTRACT**

Secure transmission of data is provided between a plurality of computer systems over a public communication system, such as the Internet. Secure transmission of data is provided from a customer computer system to a merchant computer system, and for the further secure transmission of payment information from the merchant computer system to a payment gateway computer system. The payment gateway system receives encrypted payment requests from merchants, as HTTP POST messages via the Internet. The gateway then unwraps and decrypts the requests, authenticates digital signatures of the requests based on certificates, supports transaction types and card types as required by a financial institution, and accepts concurrent VPOS transactions from each of the merchant servers. Then, the gateway converts transaction data to host-specific formats and forwards the mapped requests to the host processor using the existing financial network. The gateway architecture includes three distinct sections to enhance distribution of the functions. The upper API consists of concise functions which are available via a call out interface to custom modules. The lower API allows the gateway and the custom modules to call in to reusable functions which facilitate isolation from possible future fluctuations in structural definitions of SET data elements. The system configuration custom parameters include the more static information elements required for such things as the network address of the host or its proxy equipment, timeout values, expected length of certain messages and other system configuration information. These parameters are specified as name-value pairs in the gateway system initialization file.

34 Claims, 59 Drawing Sheets



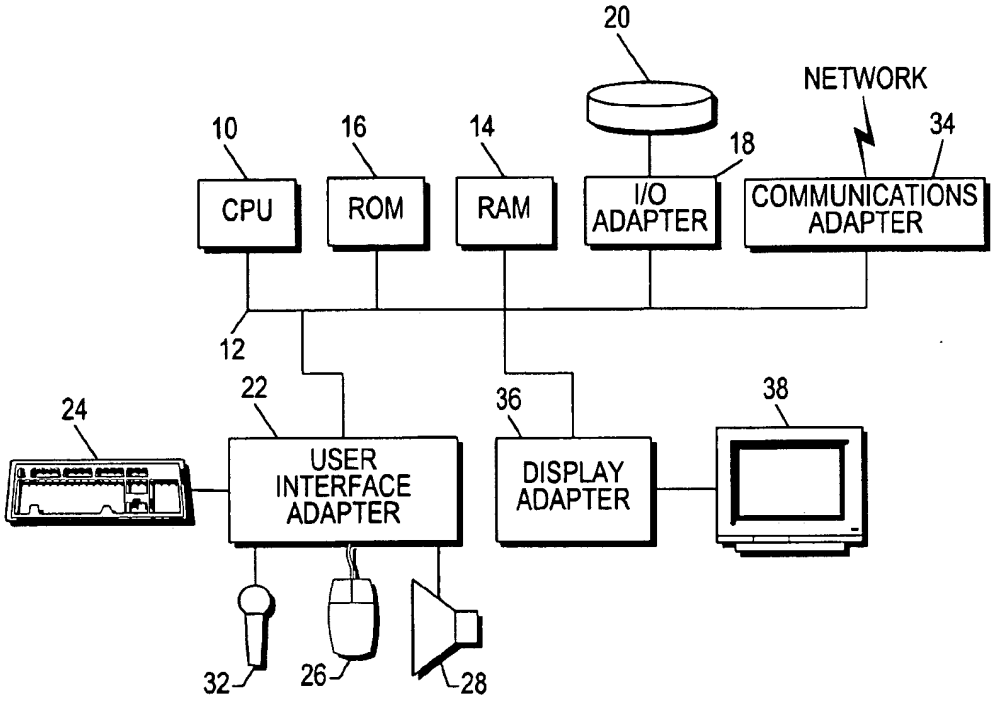

20
NETWORK
10
16
14
18
34
CPU
ROM
RAM
I/O ADAPTER
COMMUNICATIONS ADAPTER
12
22
36
38
24
USER INTERFACE ADAPTER
DISPLAY ADAPTER
32
26
28

FIG. 1A

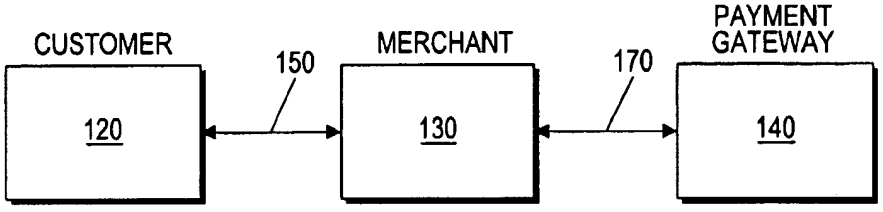

CUSTOMER
150
MERCHANT
170
PAYMENT GATEWAY
120
130
140

FIG. 1B

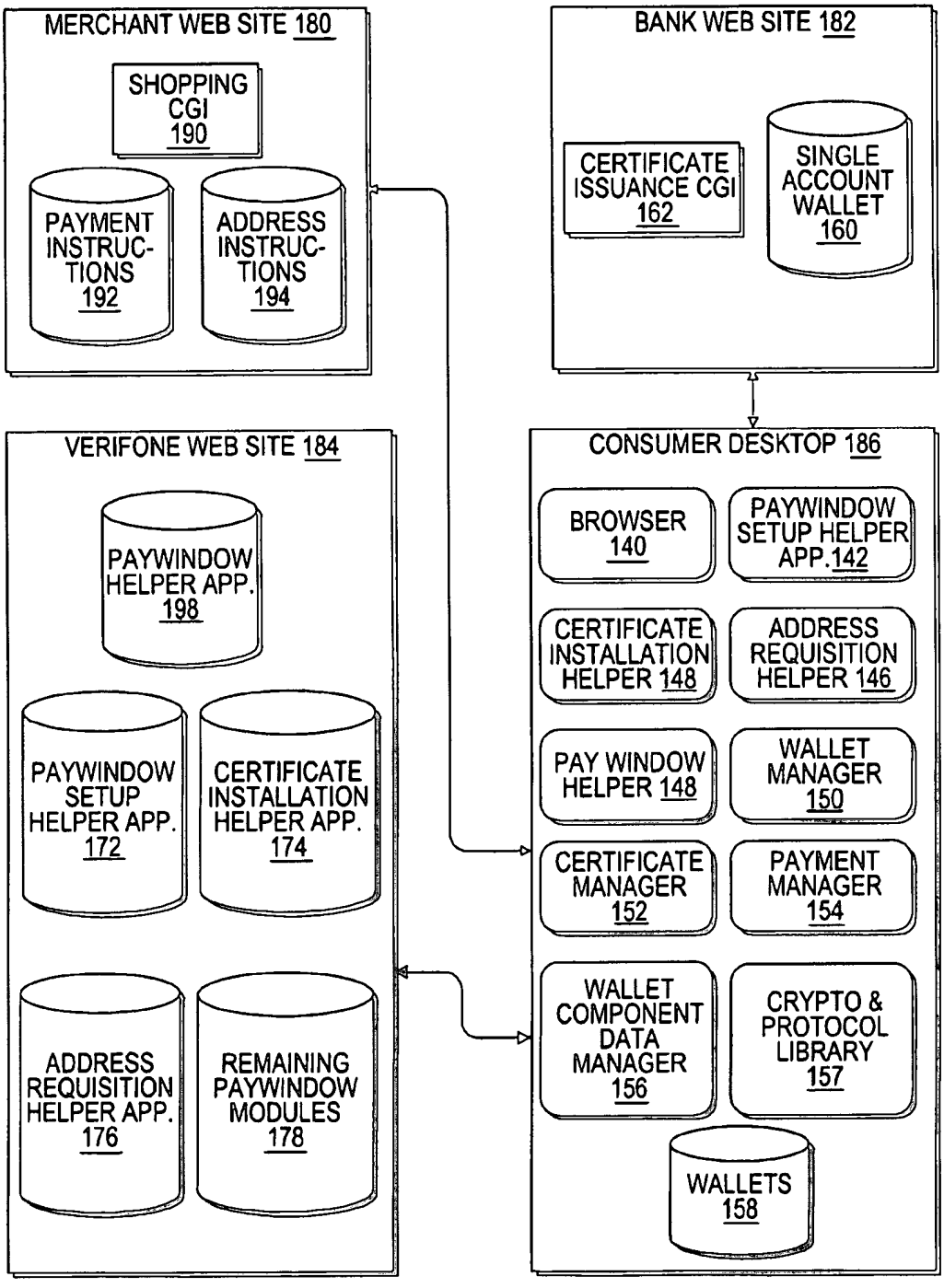

MERCHANT WEB SITE 180
SHOPPING CGI 190
PAYMENT INSTRUC-TIONS 192
ADDRESS INSTRUC-TIONS 194
BANK WEB SITE 182
CERTIFICATE ISSUANCE CGI 162
SINGLE ACCOUNT WALLET 160
VERIFONE WEB SITE 184
PAYWINDOW HELPER APP. 198
PAYWINDOW SETUP HELPER APP. 172
CERTIFICATE INSTALLATION HELPER APP. 174
ADDRESS REQUISITION HELPER APP. 176
REMAINING PAYWINDOW MODULES 178
CONSUMER DESKTOP 186
BROWSER 140
PAYWINDOW SETUP HELPER APP. 142
CERTIFICATE INSTALLATION HELPER 148
ADDRESS REQUISITION HELPER 146
PAY WINDOW HELPER 148
WALLET MANAGER 150
CERTIFICATE MANAGER 152
PAYMENT MANAGER 154
WALLET COMPONENT DATA MANAGER 156
CRYPTO & PROTOCOL LIBRARY 157
WALLETS 158

FIG. 1C

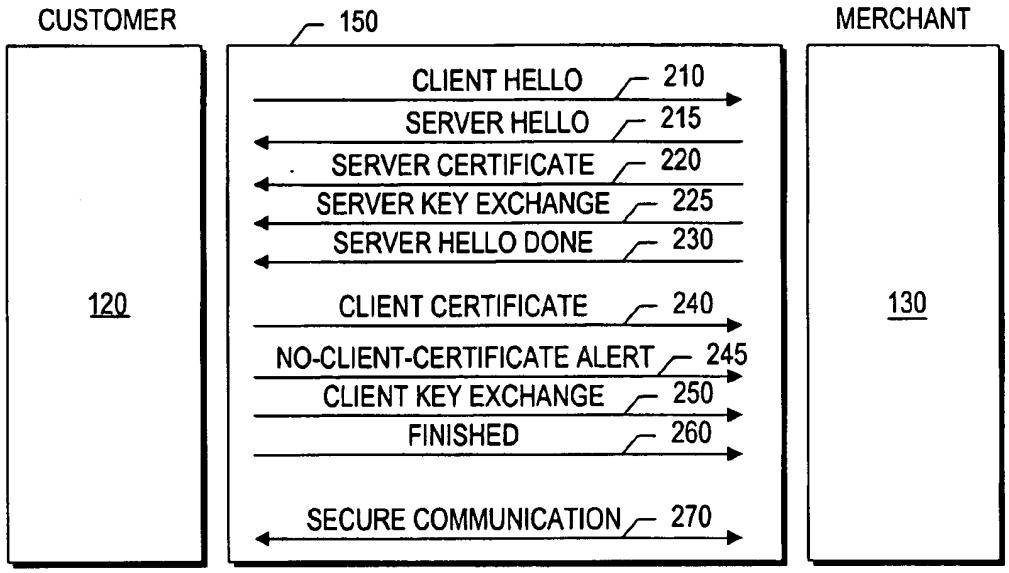

CUSTOMER
150
MERCHANT
CLIENT HELLO 210
SERVER HELLO 215
SERVER CERTIFICATE 220
SERVER KEY EXCHANGE 225
SERVER HELLO DONE 230
120
CLIENT CERTIFICATE 240
NO-CLIENT-CERTIFICATE ALERT 245
CLIENT KEY EXCHANGE 250
FINISHED 260
130
SECURE COMMUNICATION 270

FIG. 2

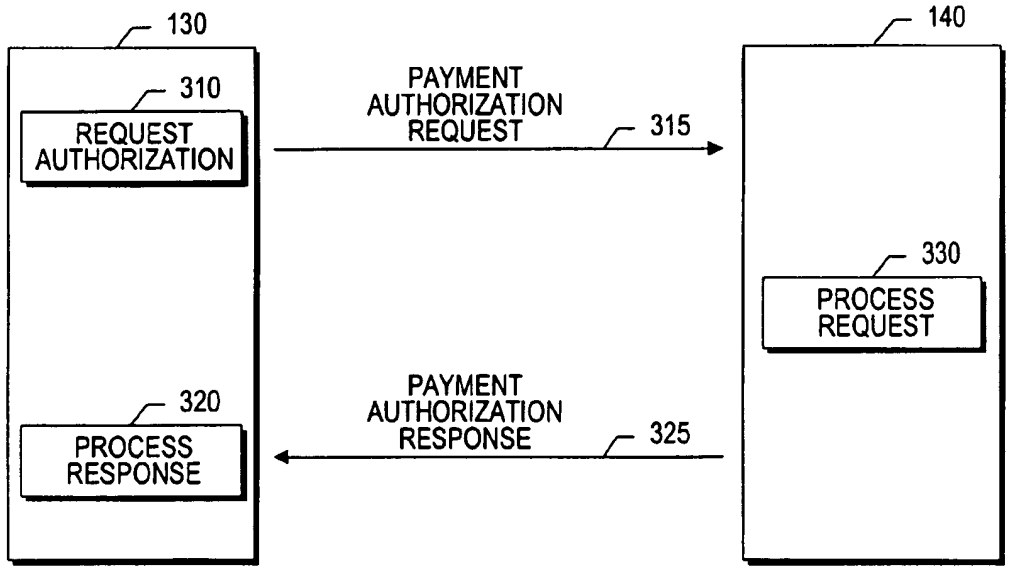

130
140
310
REQUEST AUTHORIZATION
PAYMENT AUTHORIZATION REQUEST 315
330
PROCESS REQUEST
320
PROCESS RESPONSE
PAYMENT AUTHORIZATION RESPONSE 325

FIG. 3

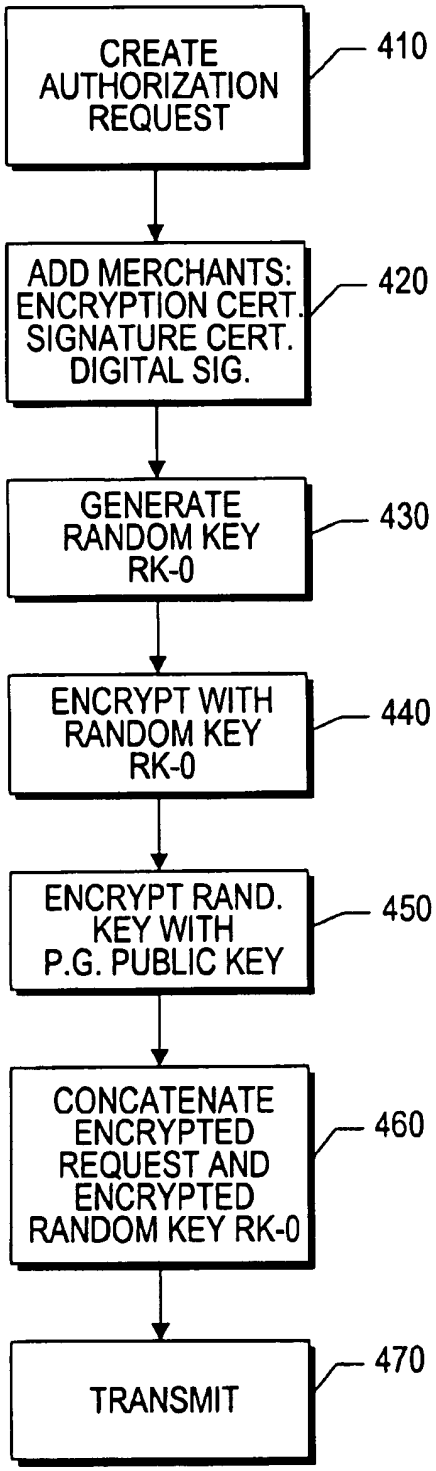

CREATE AUTHORIZATION REQUEST
410
ADD MERCHANTS: ENCRYPTION CERT. SIGNATURE CERT. DIGITAL SIG.
420
GENERATE RANDOM KEY RK-0
430
ENCRYPT WITH RANDOM KEY RK-0
440
ENCRYPT RAND. KEY WITH P.G. PUBLIC KEY
450
CONCATENATE ENCRYPTED REQUEST AND ENCRYPTED RANDOM KEY RK-0
460
TRANSMIT
470

FIG. 4

FIG. 5A

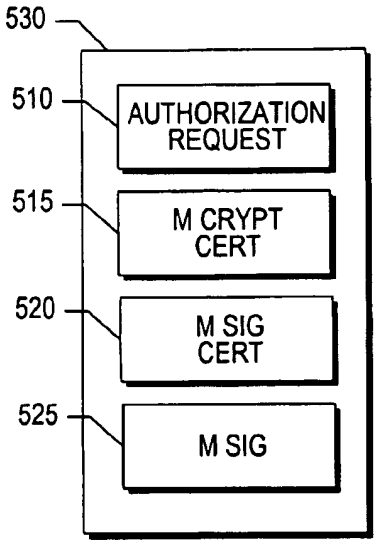


FIG. 5B

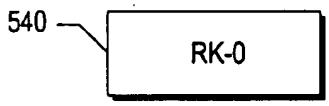


FIG. 5C

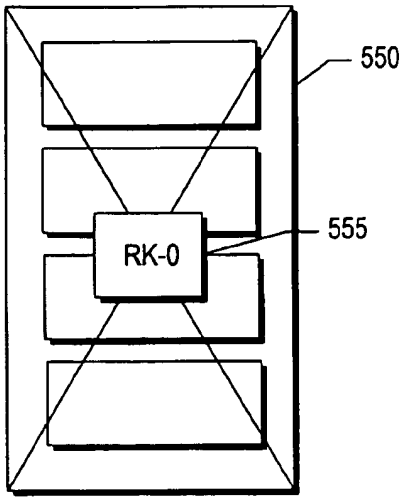


FIG. 5D

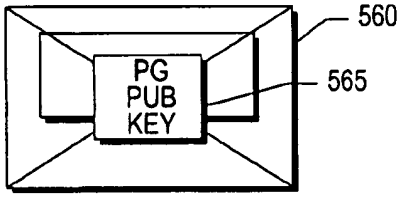


FIG. 5E

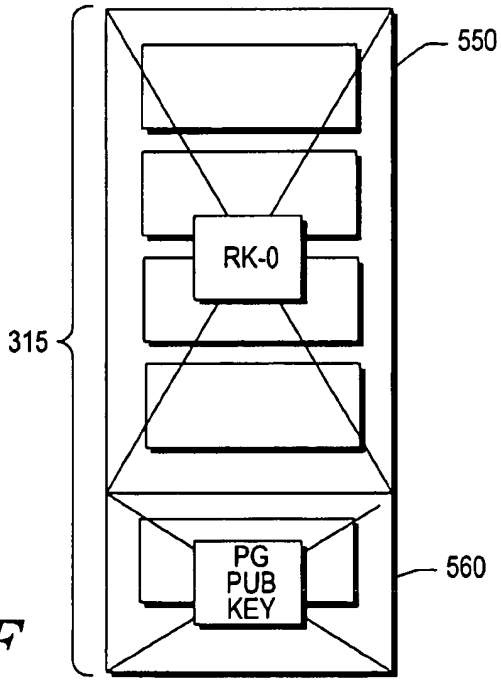


FIG. 5F

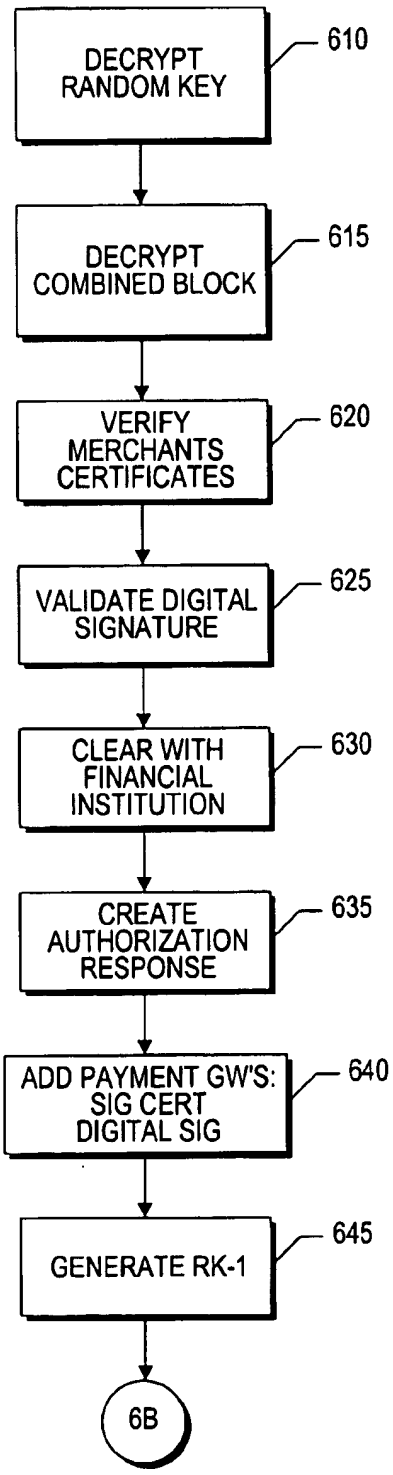

DECRYPT RANDOM KEY
610
DECRYPT COMBINED BLOCK
615
VERIFY MERCHANTS CERTIFICATES
620
VALIDATE DIGITAL SIGNATURE
625
CLEAR WITH FINANCIAL INSTITUTION
630
CREATE AUTHORIZATION RESPONSE
635
ADD PAYMENT GW'S: SIG CERT DIGITAL SIG
640
GENERATE RK-1
645
6B

FIG. 6A

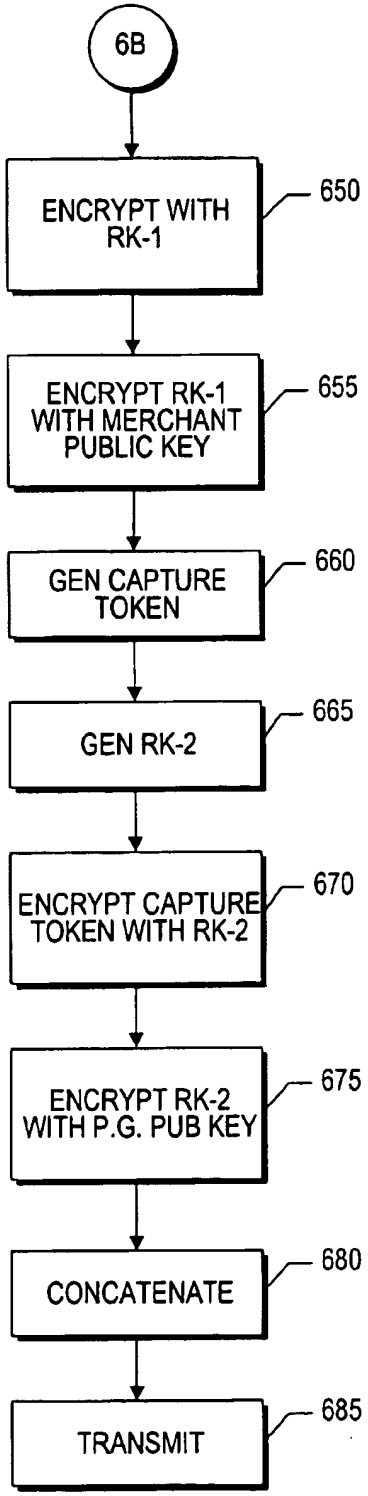

6B
ENCRYPT WITH RK-1
650
ENCRYPT RK-1 WITH MERCHANT PUBLIC KEY
655
GEN CAPTURE TOKEN
660
GEN RK-2
665
ENCRYPT CAPTURE TOKEN WITH RK-2
670
ENCRYPT RK-2 WITH P.G. PUB KEY
675
CONCATENATE
680
TRANSMIT
685

FIG. 6B

FIG. 7A

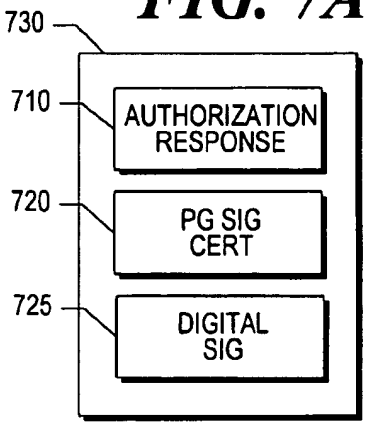


FIG. 7B

FIG. 7C

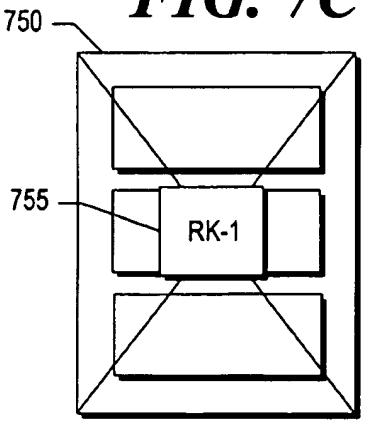


FIG. 7D

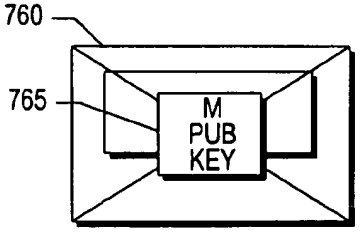


FIG. 7E

FIG. 7F

FIG. 7G

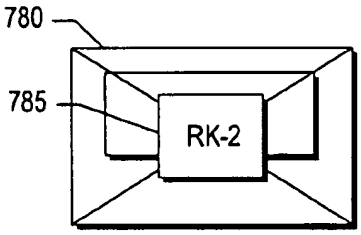


FIG. 7H

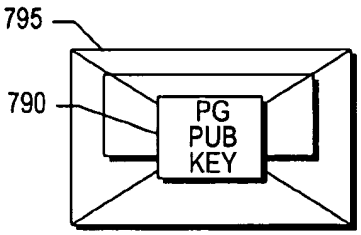


FIG. 7I

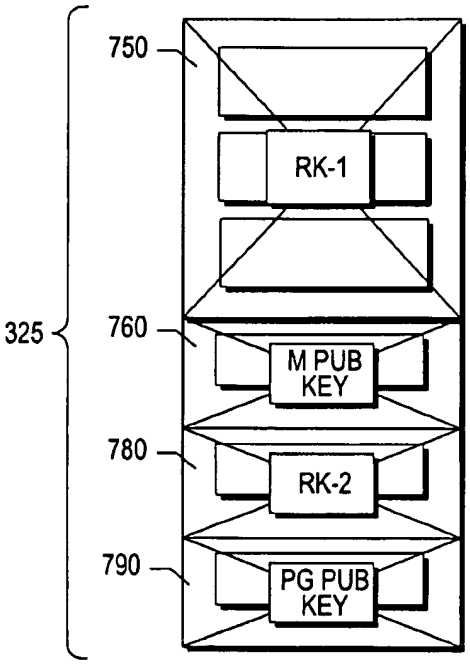


FIG. 7J

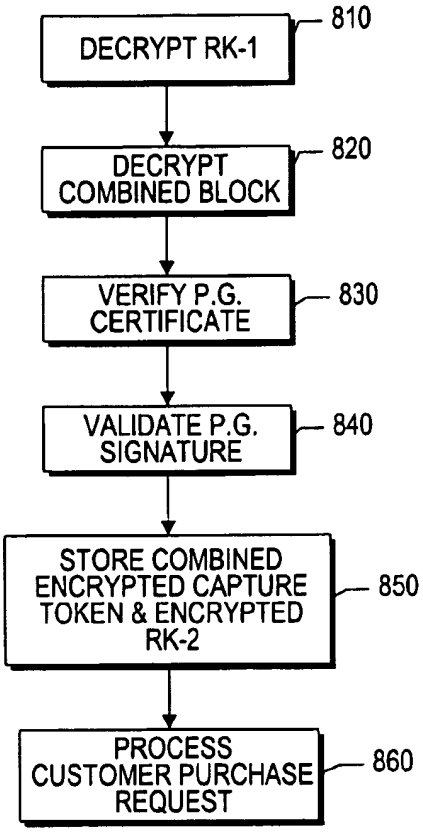

DECRYPT RK-1
810
DECRYPT COMBINED BLOCK
820
VERIFY P.G. CERTIFICATE
830
VALIDATE P.G. SIGNATURE
840
STORE COMBINED ENCRYPTED CAPTURE TOKEN & ENCRYPTED RK-2
850
PROCESS CUSTOMER PURCHASE REQUEST
860

FIG. 8

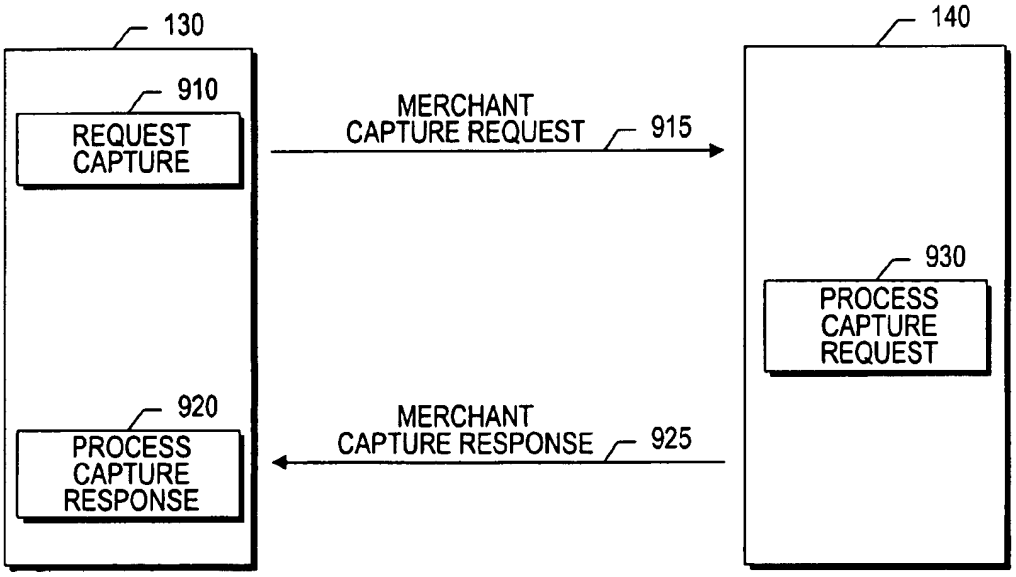

130
910
REQUEST CAPTURE
MERCHANT CAPTURE REQUEST
915
140
930
PROCESS CAPTURE REQUEST
920
PROCESS CAPTURE RESPONSE
MERCHANT CAPTURE RESPONSE
925

FIG. 9

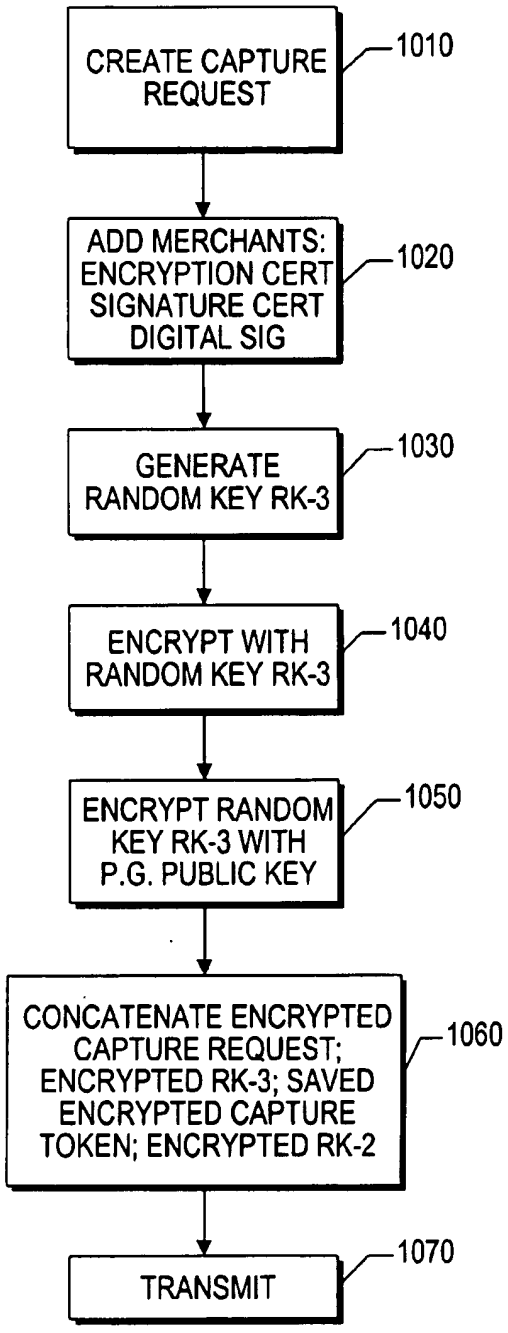

CREATE CAPTURE REQUEST
1010
ADD MERCHANTS: ENCRYPTION CERT SIGNATURE CERT DIGITAL SIG
1020
GENERATE RANDOM KEY RK-3
1030
ENCRYPT WITH RANDOM KEY RK-3
1040
ENCRYPT RANDOM KEY RK-3 WITH P.G. PUBLIC KEY
1050
CONCATENATE ENCRYPTED CAPTURE REQUEST; ENCRYPTED RK-3; SAVED ENCRYPTED CAPTURE TOKEN; ENCRYPTED RK-2
1060
TRANSMIT
1070

FIG. 10

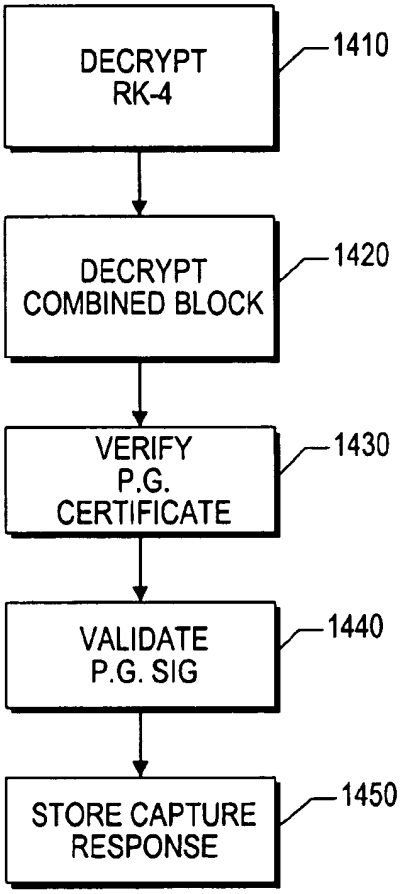

DECRYPT RK-4
1410
DECRYPT COMBINED BLOCK
1420
VERIFY P.G. CERTIFICATE
1430
VALIDATE P.G. SIG
1440
STORE CAPTURE RESPONSE
1450

FIG. 14

FIG. 11A

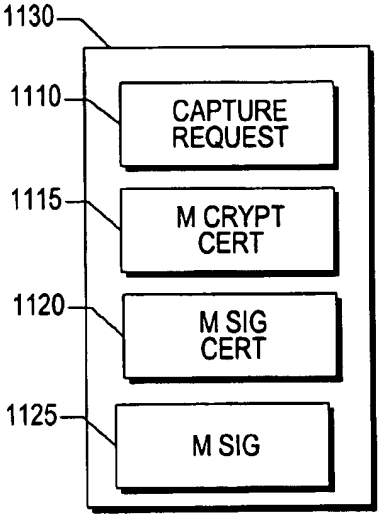


FIG. 11B

FIG. 11C

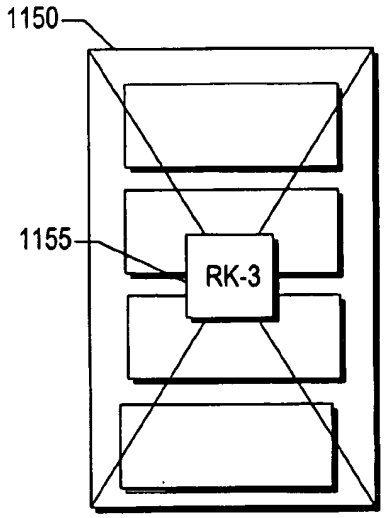


FIG. 11D

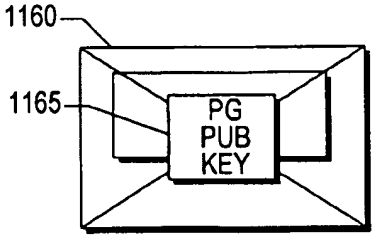


FIG. 11E

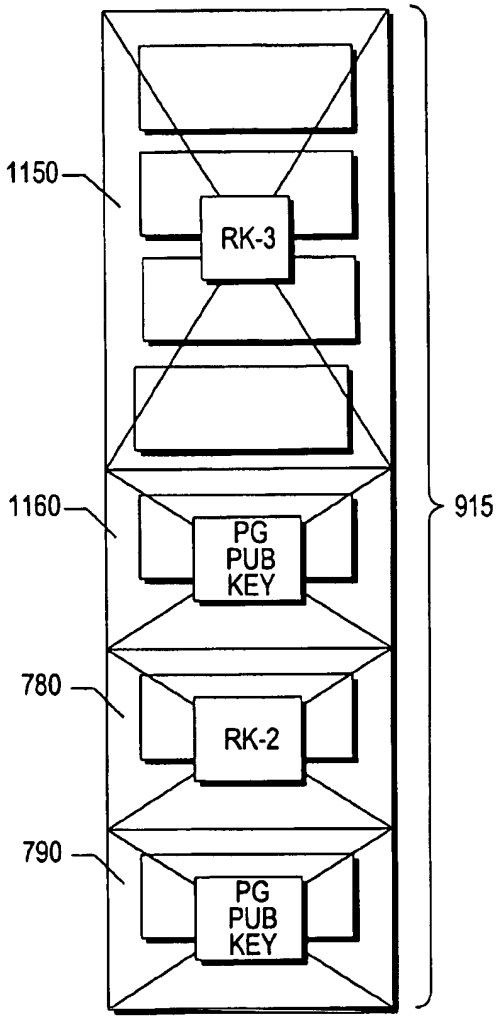


FIG. 11F

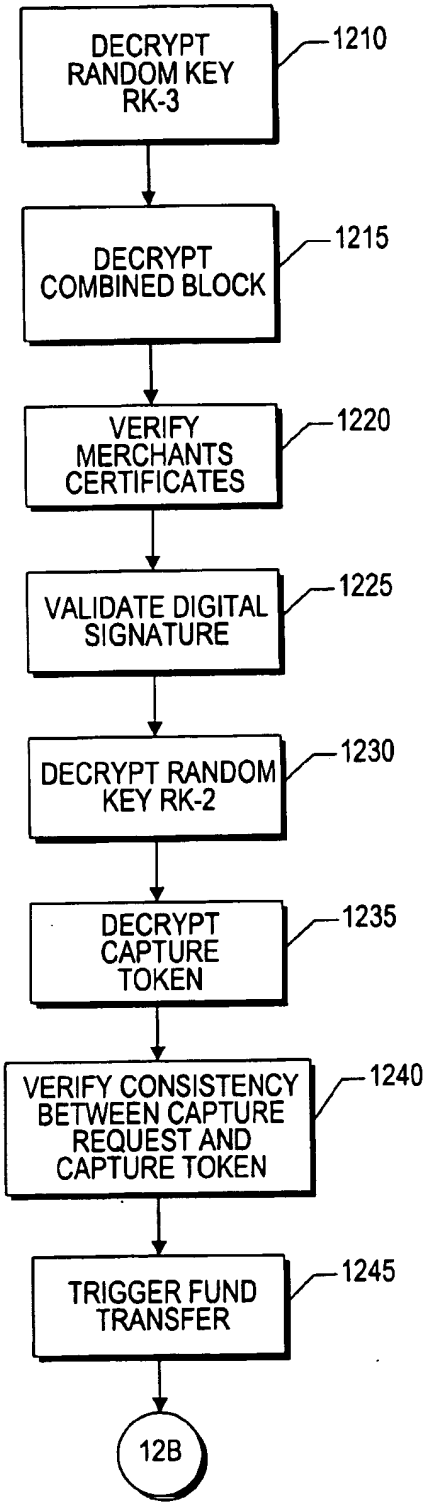


FIG. 12A

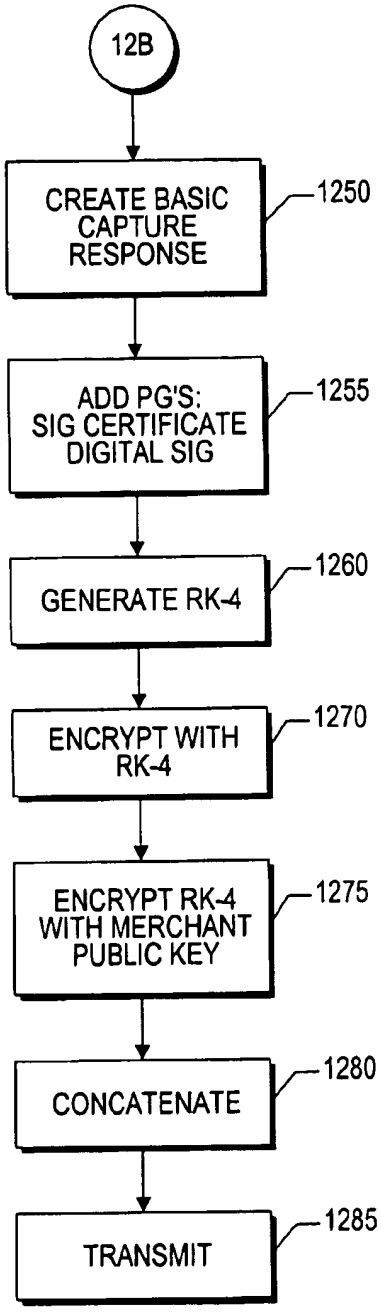


FIG. 12B

FIG. 13A

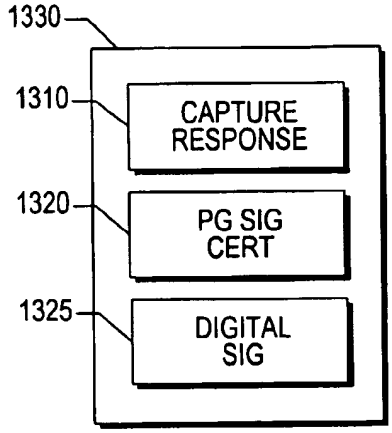


FIG. 13B

FIG. 13C

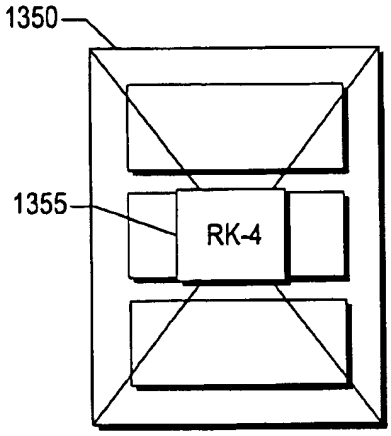


FIG. 13D

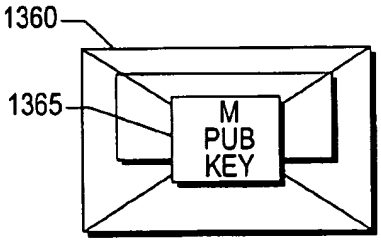


FIG. 13E

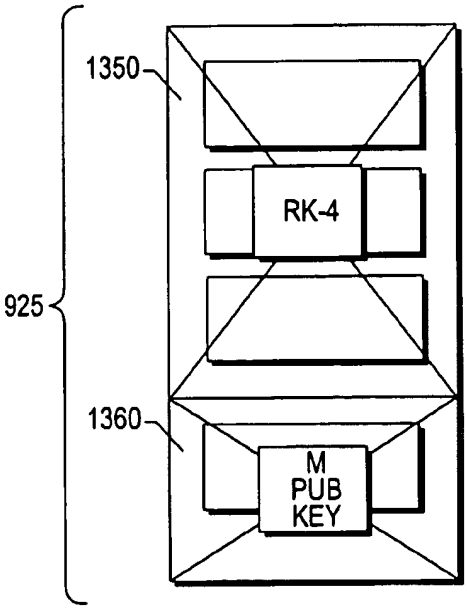


FIG. 13F

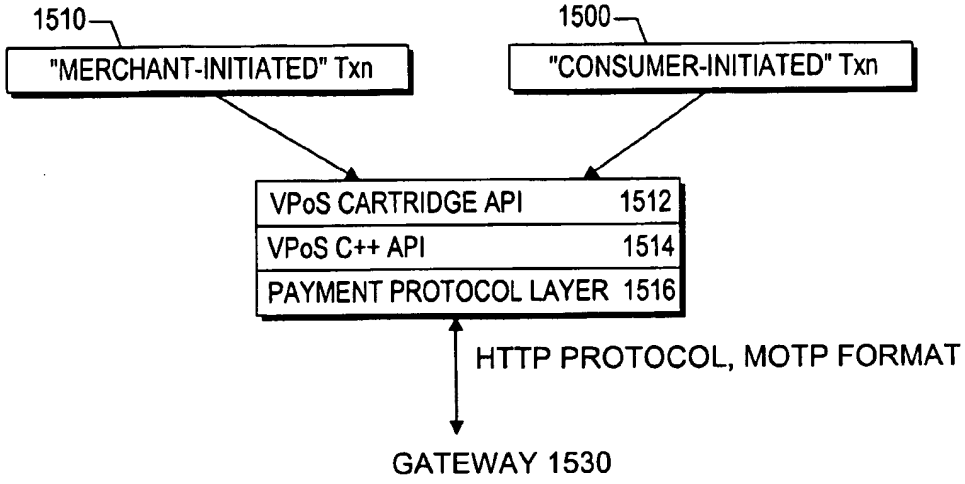


FIG. 15A

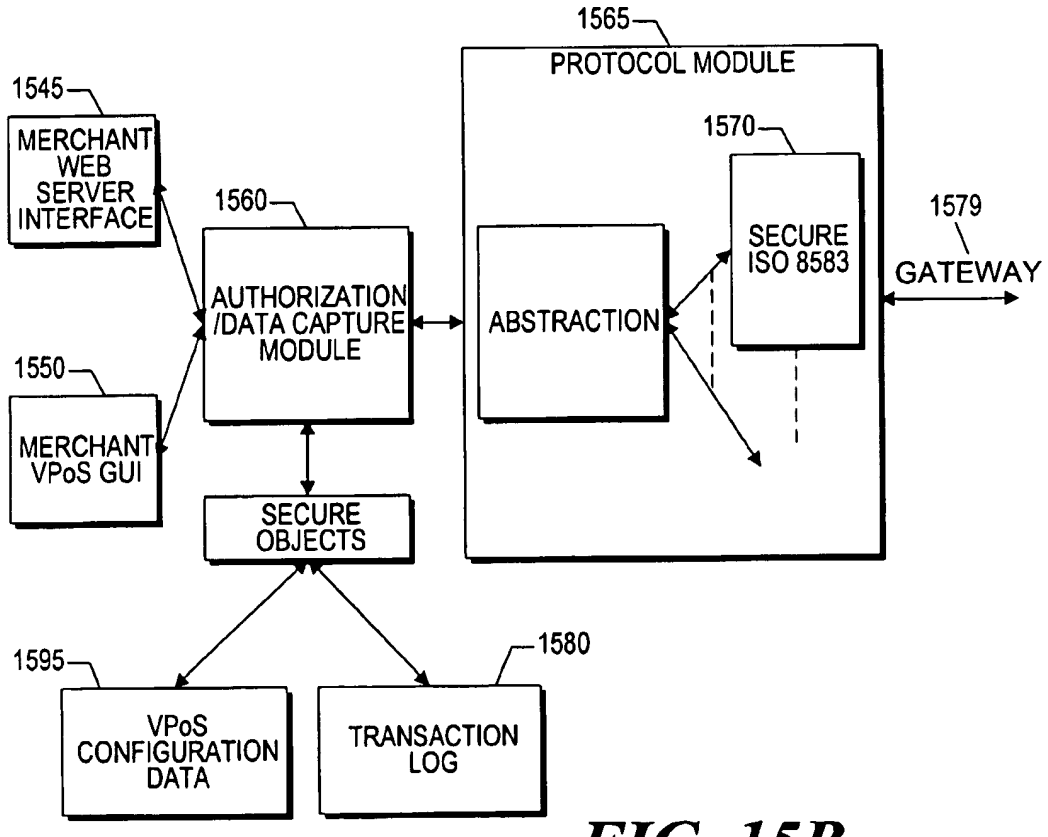


FIG. 15B

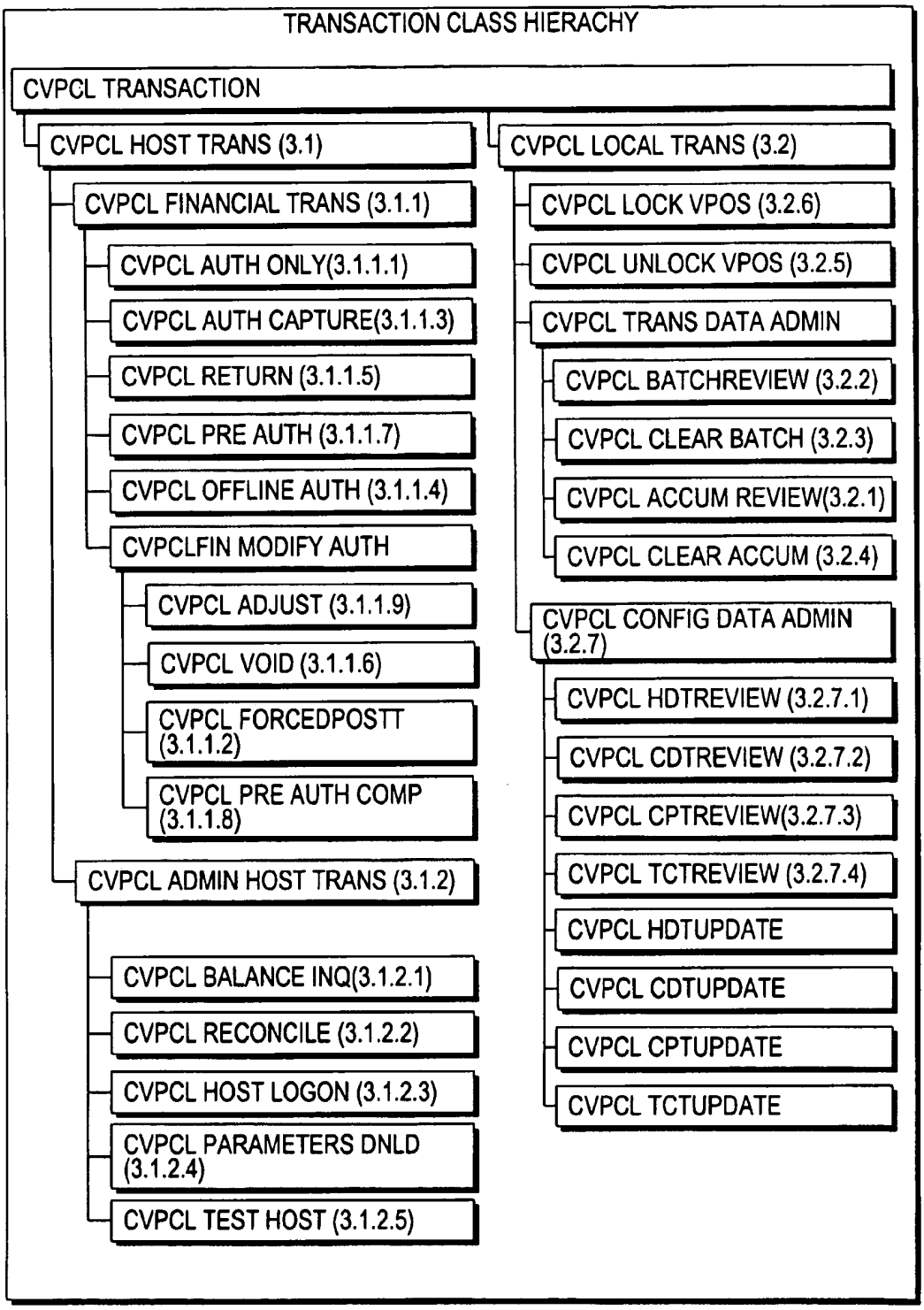

TRANSACTION CLASS HIERACHY
CVPCL TRANSACTION
CVPCL HOST TRANS (3.1)
CVPCL LOCAL TRANS (3.2)
CVPCL FINANCIAL TRANS (3.1.1)
CVPCL AUTH ONLY(3.1.1.1)
CVPCL AUTH CAPTURE(3.1.1.3)
CVPCL RETURN (3.1.1.5)
CVPCL PRE AUTH (3.1.1.7)
CVPCL OFFLINE AUTH (3.1.1.4)
CVPCLFIN MODIFY AUTH
CVPCL ADJUST (3.1.1.9)
CVPCL VOID (3.1.1.6)
CVPCL FORCEDPOSTT (3.1.1.2)
CVPCL PRE AUTH COMP (3.1.1.8)
CVPCL ADMIN HOST TRANS (3.1.2)
CVPCL BALANCE INQ(3.1.2.1)
CVPCL RECONCILE (3.1.2.2)
CVPCL HOST LOGON (3.1.2.3)
CVPCL PARAMETERS DNLD (3.1.2.4)
CVPCL TEST HOST (3.1.2.5)
CVPCL LOCK VPOS (3.2.6)
CVPCL UNLOCK VPOS (3.2.5)
CVPCL TRANS DATA ADMIN
CVPCL BATCHREVIEW (3.2.2)
CVPCL CLEAR BATCH (3.2.3)
CVPCL ACCUM REVIEW(3.2.1)
CVPCL CLEAR ACCUM (3.2.4)
CVPCL CONFIG DATA ADMIN (3.2.7)
CVPCL HDTREVIEW (3.2.7.1)
CVPCL CDTREVIEW (3.2.7.2)
CVPCL CPTREVIEW(3.2.7.3)
CVPCL TCTREVIEW (3.2.7.4)
CVPCL HDTUPDATE
CVPCL CDTUPDATE
CVPCL CPTUPDATE
CVPCL TCTUPDATE

FIG. 16

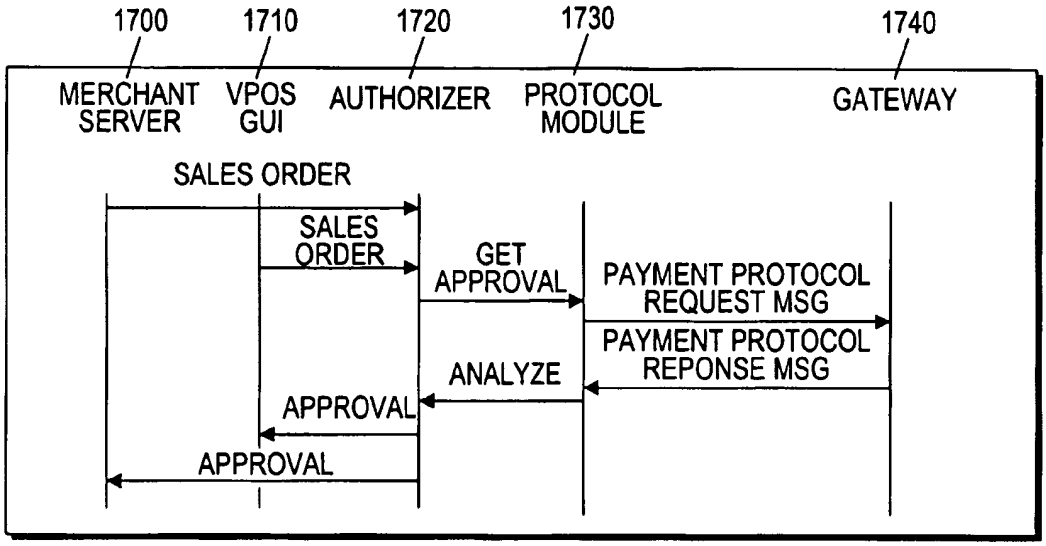


FIG. 17

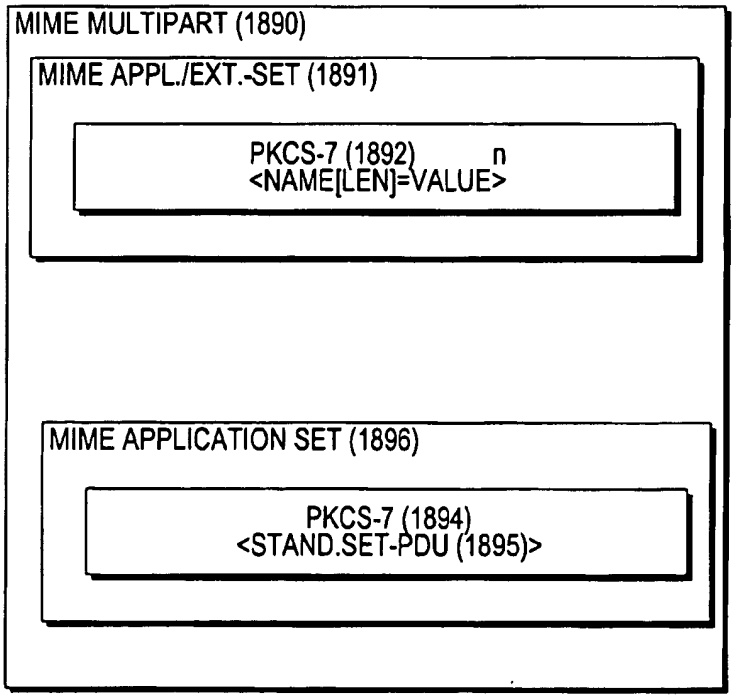


FIG. 18B

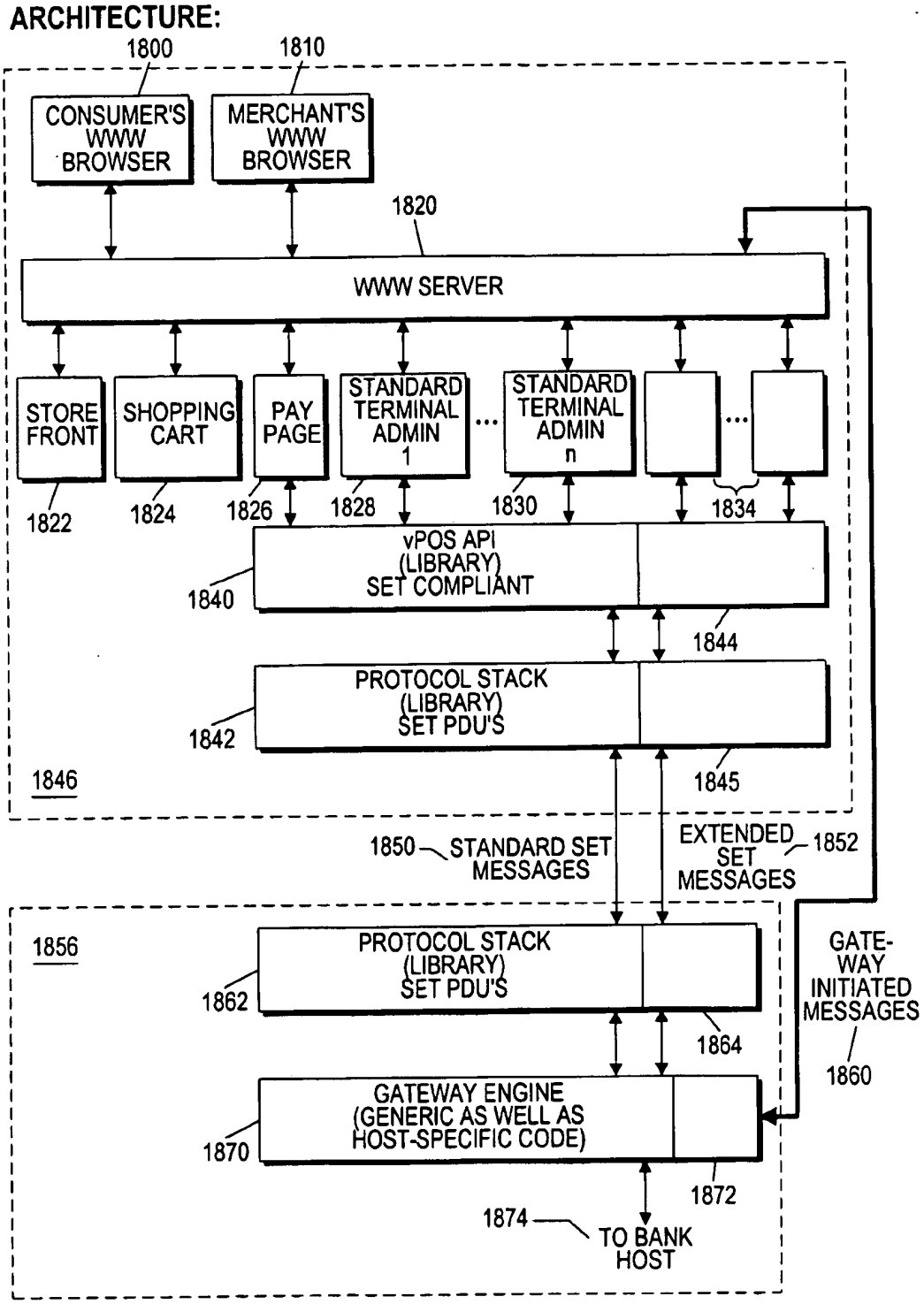

ARCHITECTURE:
1800
1810
CONSUMER'S WWW BROWSER
MERCHANT'S WWW BROWSER
1820
WWW SERVER
STORE FRONT
SHOPPING CART
PAY PAGE
STANDARD TERMINAL ADMIN 1
STANDARD TERMINAL ADMIN n
1822
1824
1826
1828
1830
1834
vPOS API (LIBRARY) SET COMPLIANT
1840
1844
PROTOCOL STACK (LIBRARY) SET PDU'S
1842
1846
1845
1850 STANDARD SET MESSAGES
EXTENDED SET MESSAGES
1852
1856
PROTOCOL STACK (LIBRARY) SET PDU'S
1862
1864
GATE-WAY INITIATED MESSAGES
1860
GATEWAY ENGINE (GENERIC AS WELL AS HOST-SPECIFIC CODE)
1870
1872
1874
TO BANK HOST

FIG. 18A

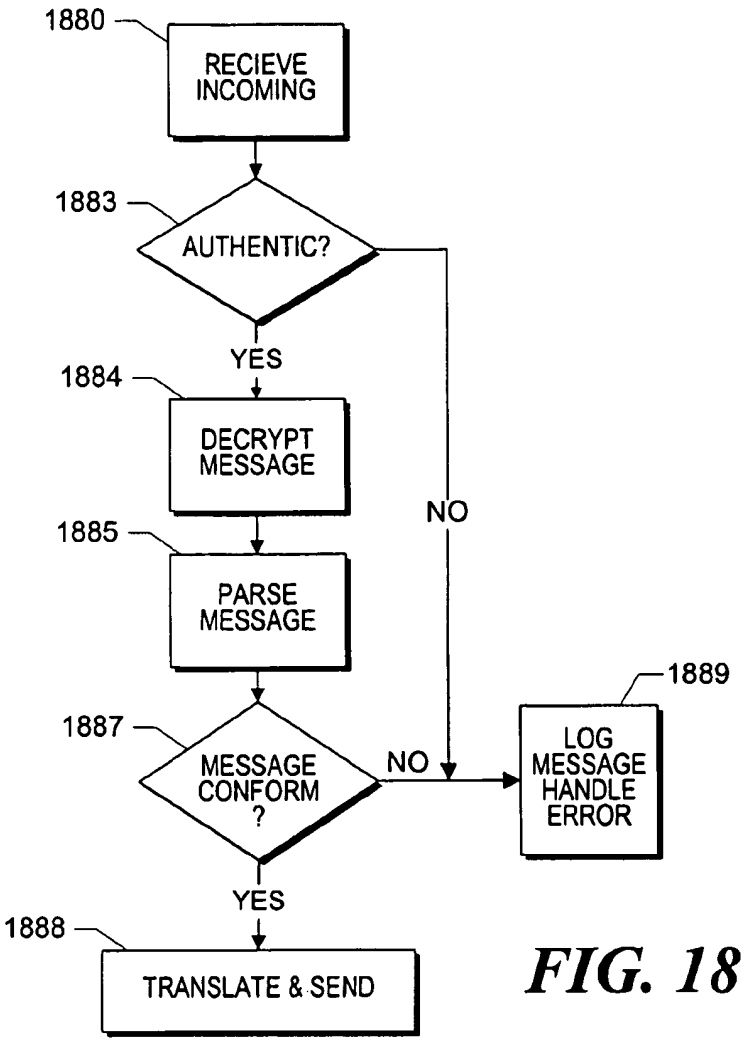


FIG. 18C

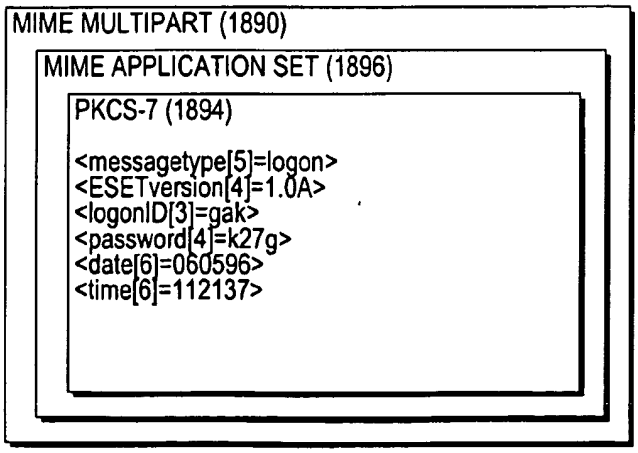


FIG. 18D

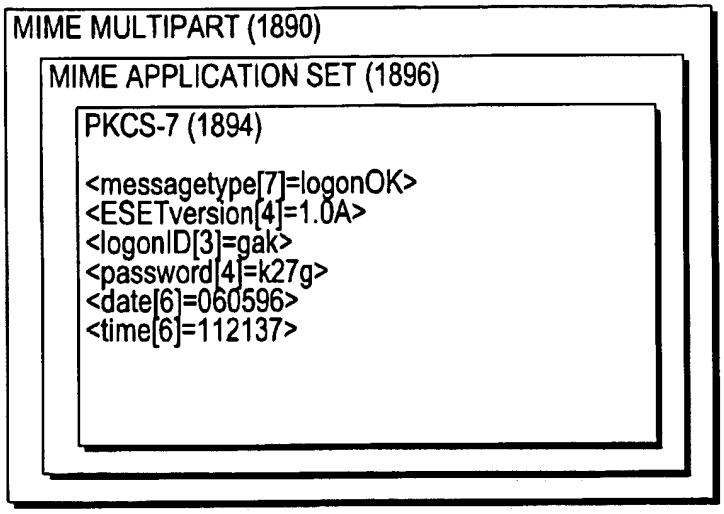


FIG. 18E

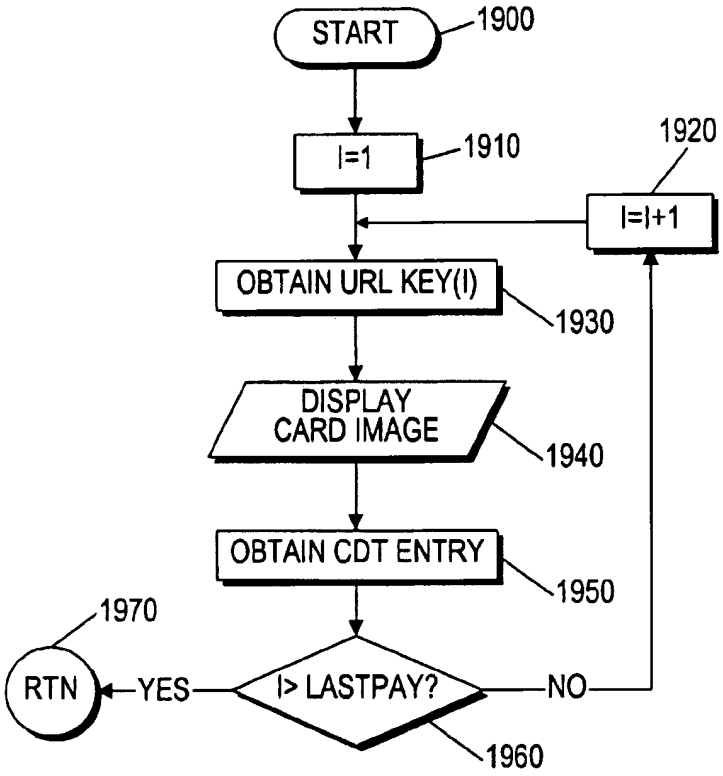


FIG. 19

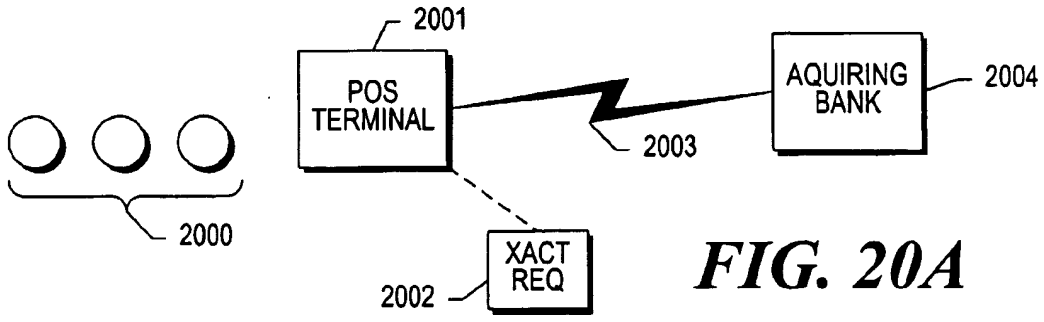


FIG. 20A

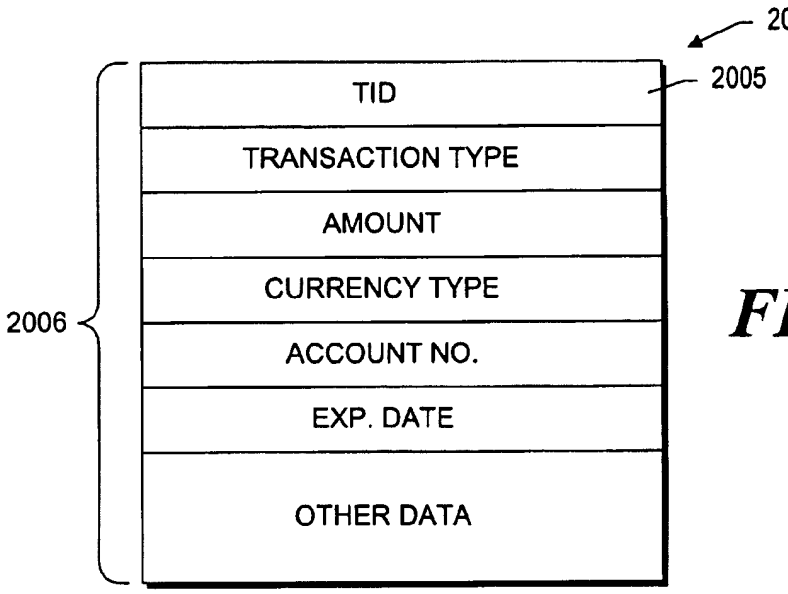


FIG. 20B

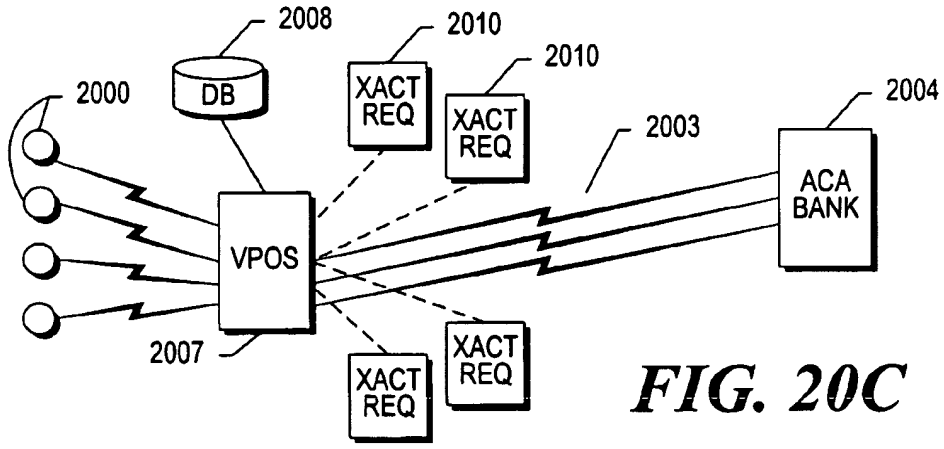


FIG. 20C

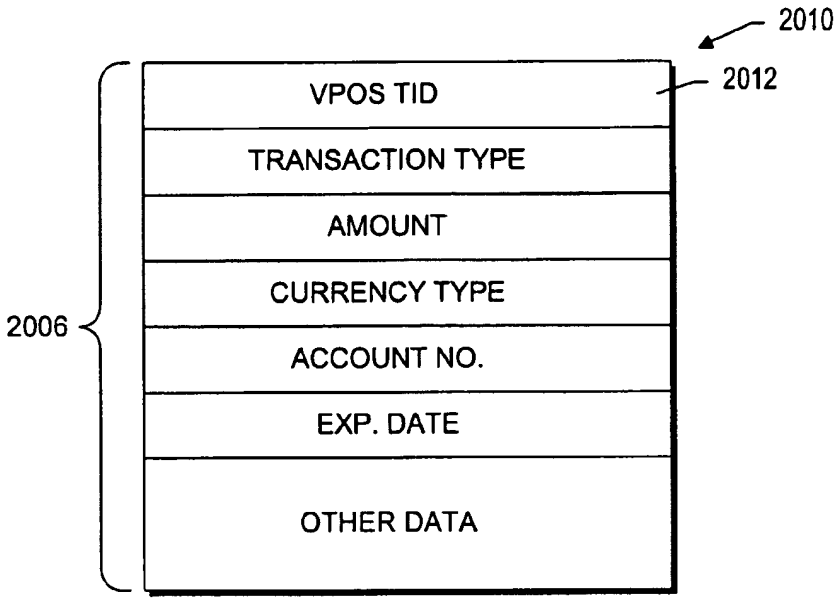


FIG. 20D

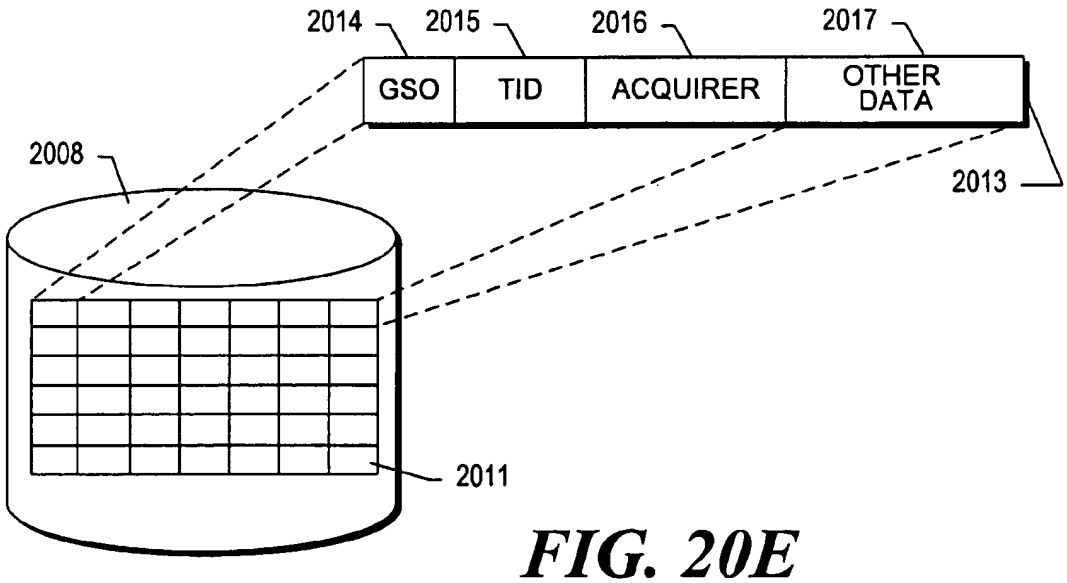


FIG. 20E

OVERVIEW USING TID
OBTAIN & RELEASE

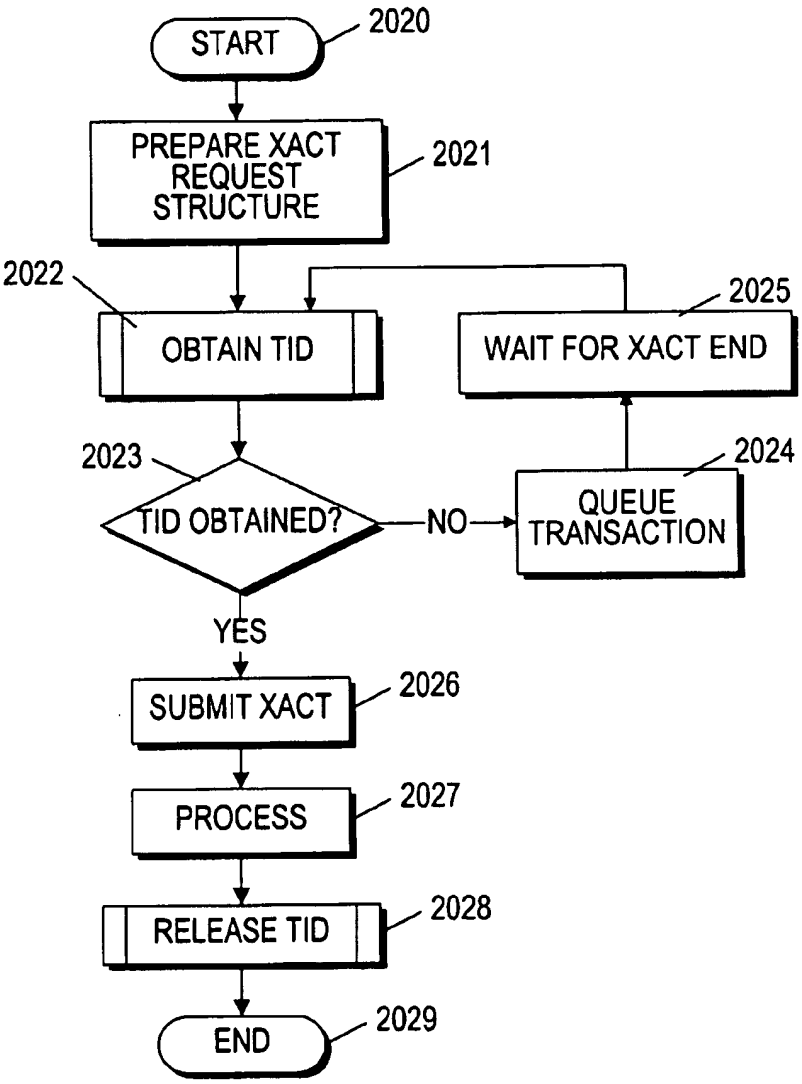


FIG. 20F

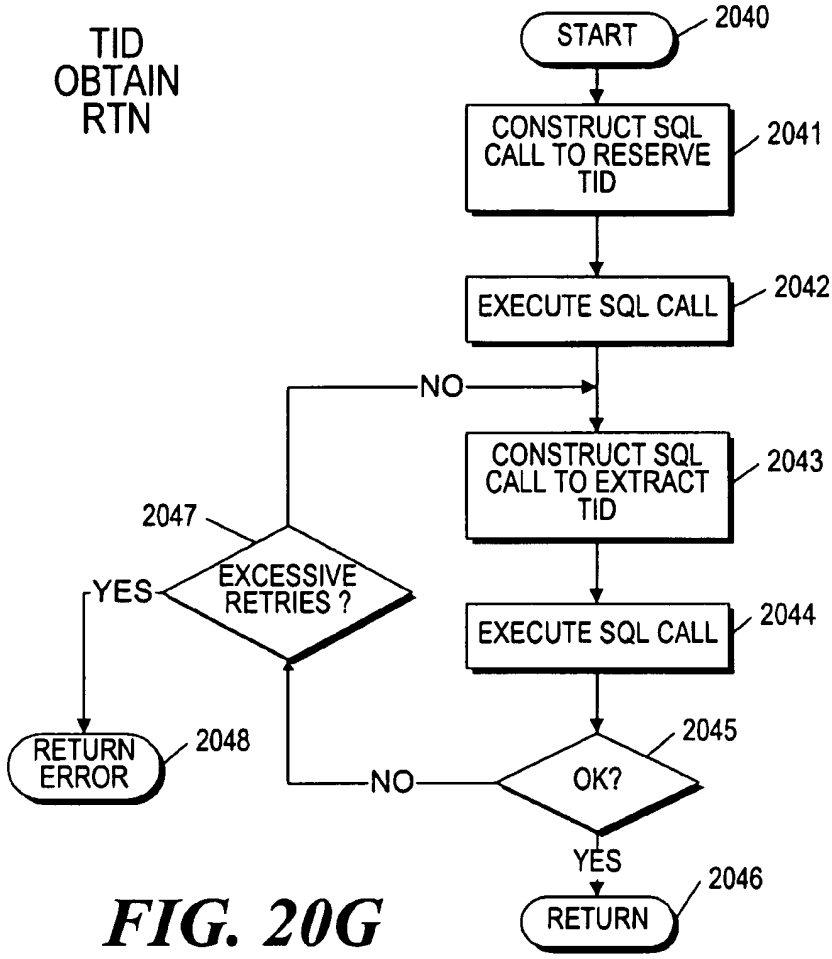


FIG. 20G

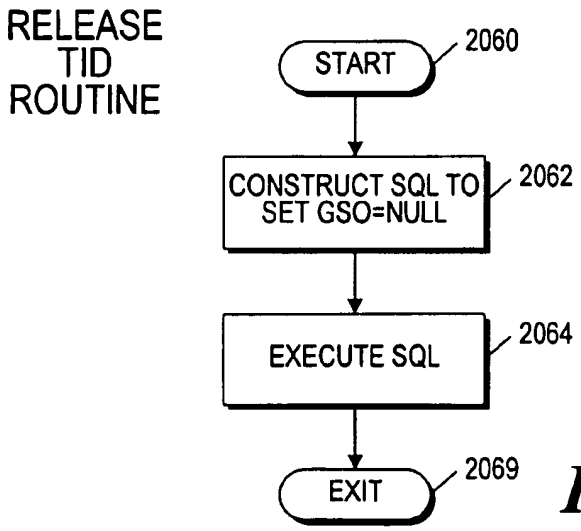


FIG. 20H

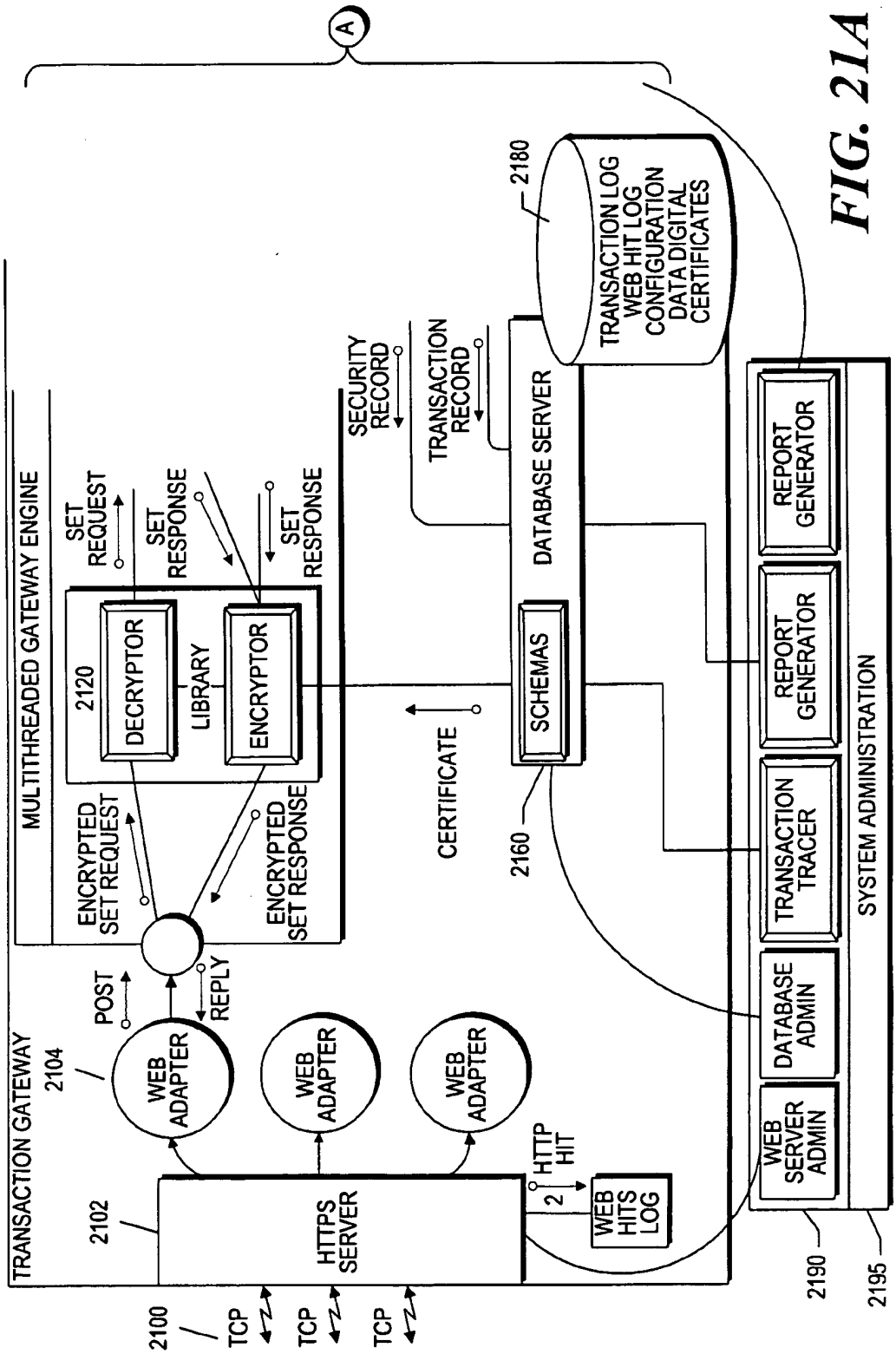

A
TRANSACTION GATEWAY
2104
WEB ADAPTER
WEB ADAPTER
WEB ADAPTER
POST
REPLY
2102
HTTPS SERVER
HTTP HIT
2
WEB HITS LOG
2100
TCP
TCP
TCP
MULTITHREADED GATEWAY ENGINE
ENCRYPTED SET REQUEST
ENCRYPTED SET RESPONSE
2120
DECRYPTOR
LIBRARY
ENCRYPTOR
SET REQUEST
SET RESPONSE
SET RESPONSE
SECURITY RECORD
TRANSACTION RECORD
CERTIFICATE
2160
SCHEMAS
DATABASE SERVER
2180
TRANSACTION LOG
WEB HIT LOG
CONFIGURATION DATA
DIGITAL CERTIFICATES
REPORT GENERATOR
REPORT GENERATOR
TRANSACTION TRACER
DATABASE ADMIN
WEB SERVER ADMIN
SYSTEM ADMINISTRATION
2190
2195

FIG. 21A

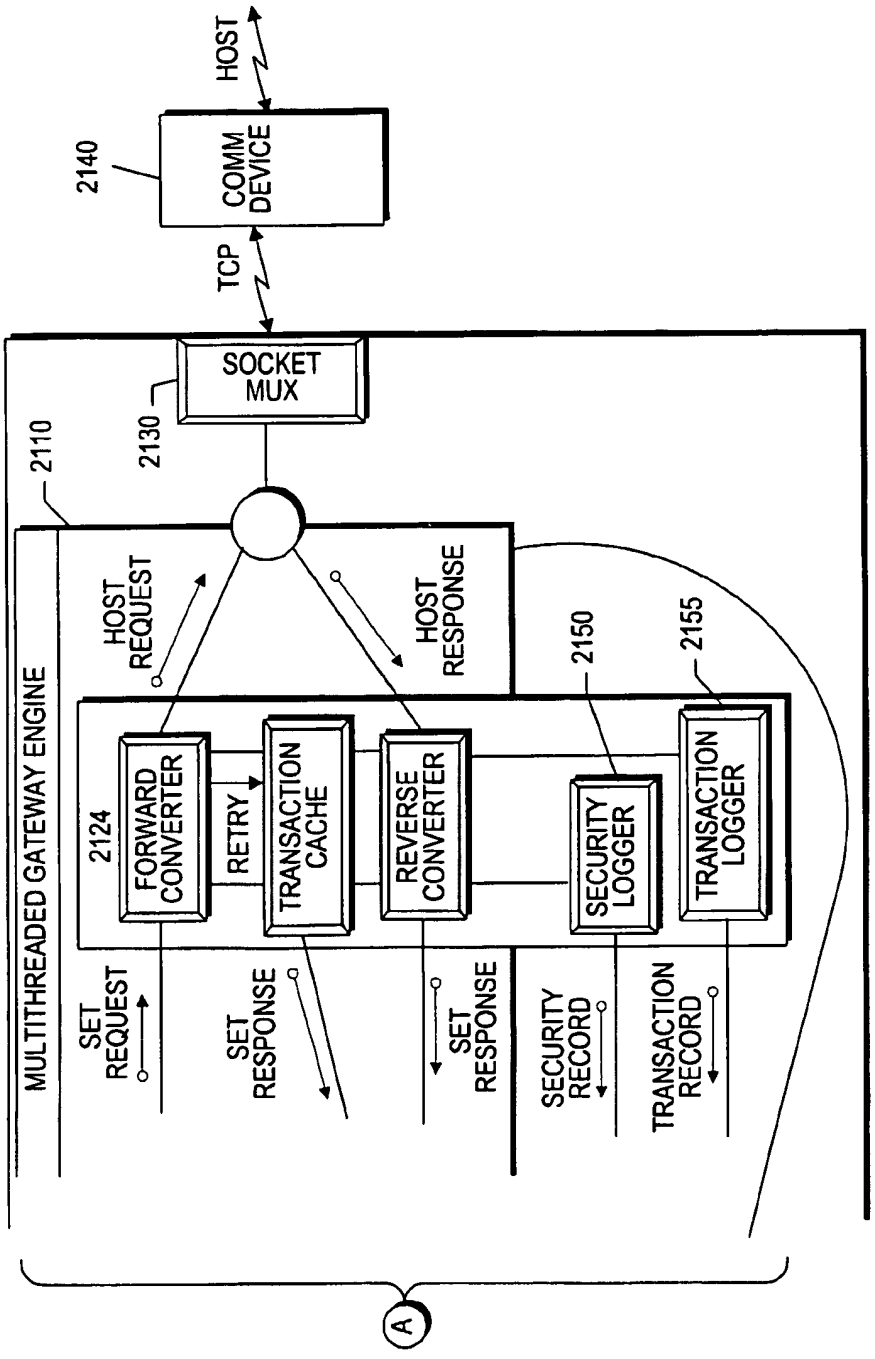

HOST
2140
COMM DEVICE
TCP
SOCKET MUX
2130
2110
MULTITHREADED GATEWAY ENGINE
HOST REQUEST
HOST RESPONSE
2150
2155
2124
FORWARD CONVERTER
RETRY
TRANSACTION CACHE
REVERSE CONVERTER
SECURITY LOGGER
TRANSACTION LOGGER
SET REQUEST
SET RESPONSE
SET RESPONSE
SECURITY RECORD
TRANSACTION RECORD
A

FIG. 21B

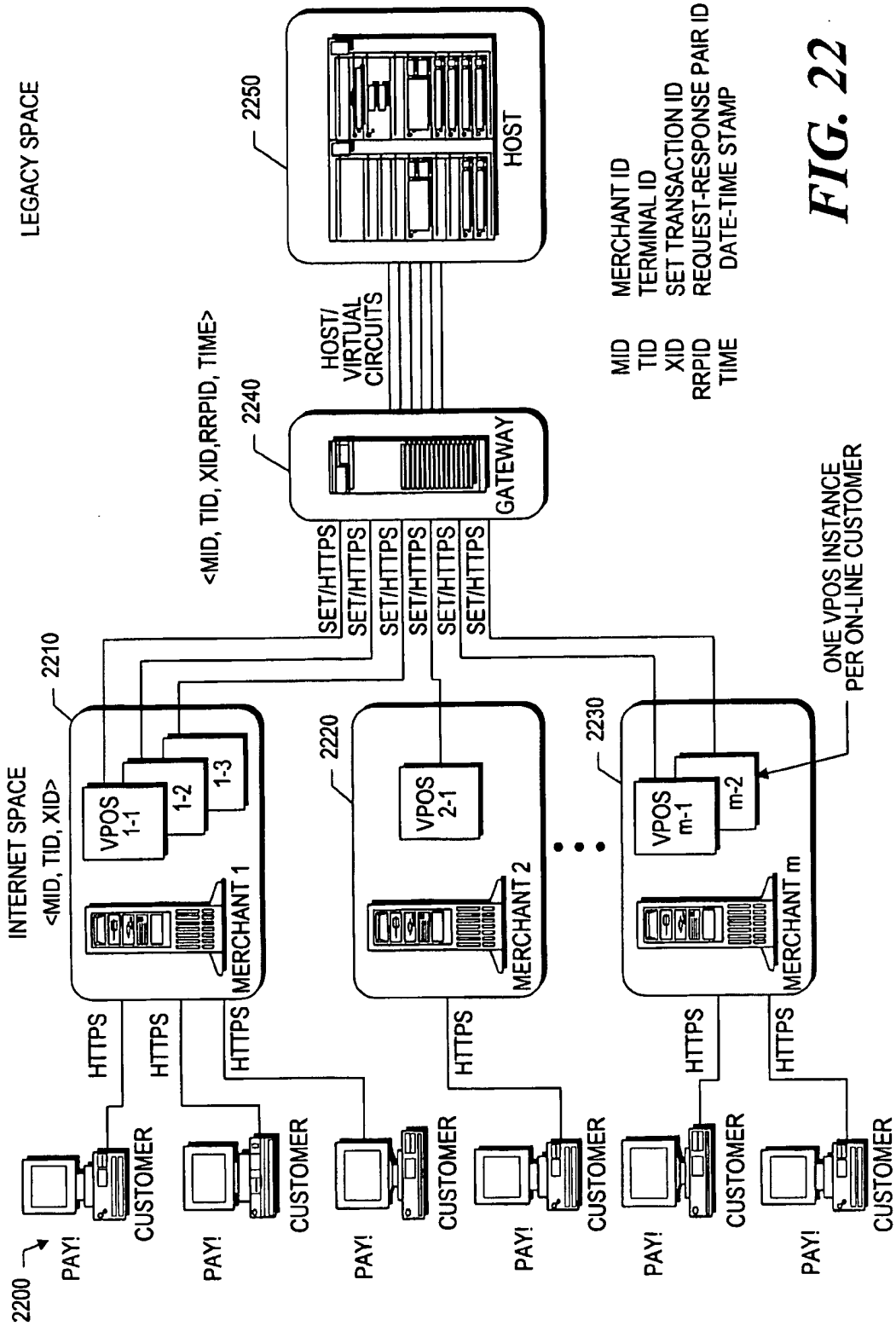

LEGACY SPACE
2250
HOST
HOST/
VIRTUAL
CIRCUITS
MID MERCHANT ID
TID TERMINAL ID
XID SET TRANSACTION ID
RRPID REQUEST-RESPONSE PAIR ID
TIME DATE-TIME STAMP
<MID, TID, XID,RRPID, TIME>
2240
GATEWAY
SET/HTTPS
ONE VPOS INSTANCE
PER ON-LINE CUSTOMER
INTERNET SPACE
<MID, TID, XID>
2210
2220
2230
VPOS
1-1
1-2
1-3
MERCHANT 1
VPOS
2-1
MERCHANT 2
VPOS
m-1
m-2
MERCHANT m
HTTPS
PAY!
CUSTOMER
2200

FIG. 22

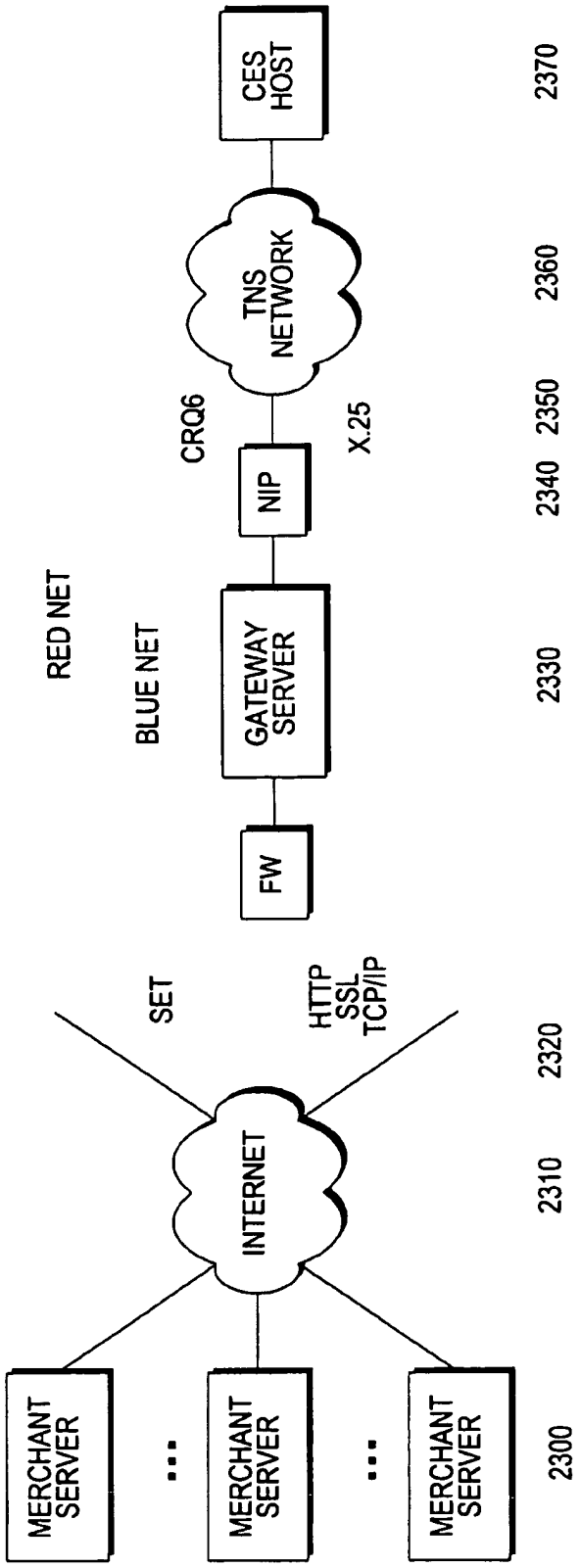

MERCHANT SERVER
MERCHANT SERVER
MERCHANT SERVER
INTERNET
SET
HTTP SSL TCP/IP
FW
GATEWAY SERVER
NIP
CRQ6
X.25
TNS NETWORK
CES HOST
RED NET
BLUE NET
2300
2310
2320
2330
2340
2350
2360
2370

FIG. 23

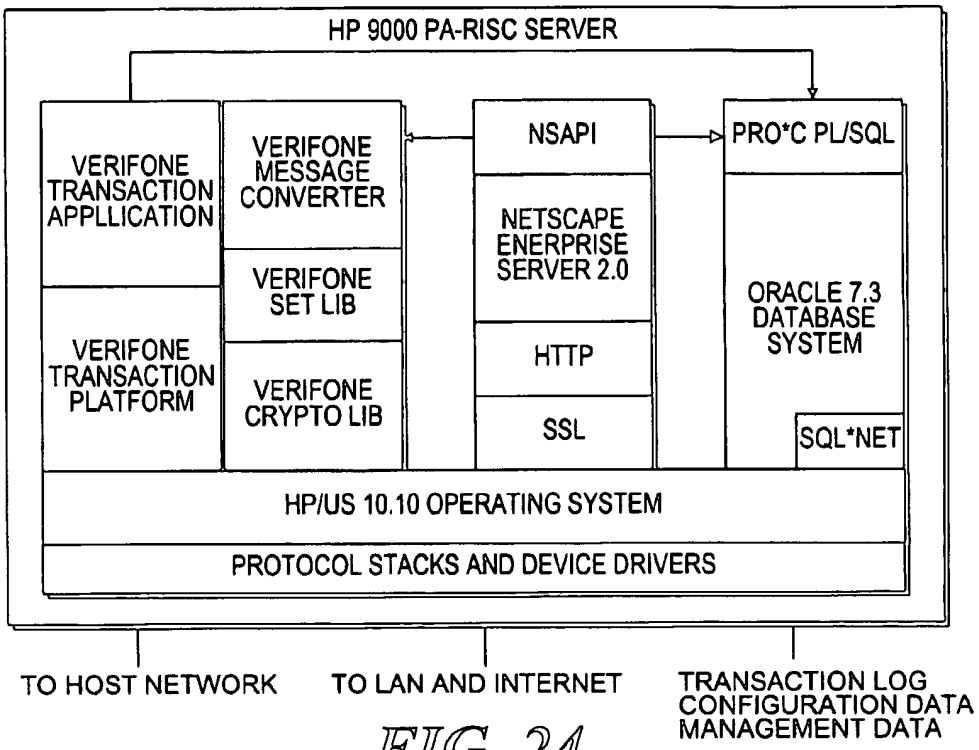

HP 9000 PA-RISC SERVER
VERIFONE TRANSACTION APPLLICATION
VERIFONE MESSAGE CONVERTER
VERIFONE SET LIB
VERIFONE CRYPTO LIB
VERIFONE TRANSACTION PLATFORM
NSAPI
NETSCAPE ENERPRISE SERVER 2.0
HTTP
SSL
PRO*C PL/SQL
ORACLE 7.3 DATABASE SYSTEM
SQL*NET
HP/US 10.10 OPERATING SYSTEM
PROTOCOL STACKS AND DEVICE DRIVERS
TO HOST NETWORK
TO LAN AND INTERNET
TRANSACTION LOG
CONFIGURATION DATA
MANAGEMENT DATA

FIG. 24

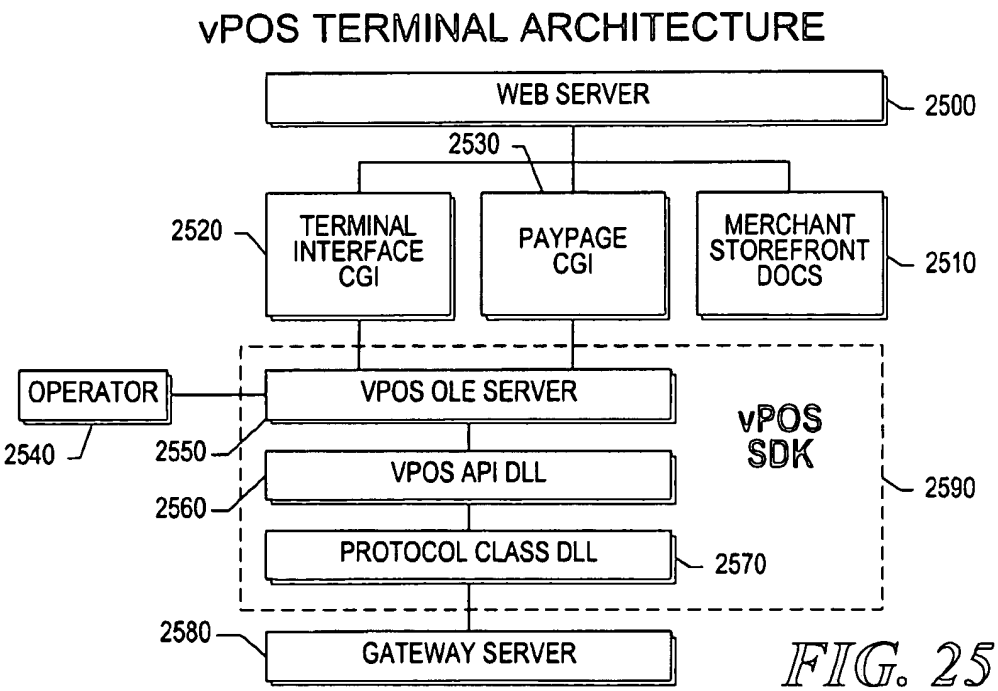

vPOS TERMINAL ARCHITECTURE
WEB SERVER
2500
2530
2520
TERMINAL INTERFACE CGI
PAYPAGE CGI
MERCHANT STOREFRONT DOCS
2510
OPERATOR
2540
VPOS OLE SERVER
2550
VPOS API DLL
2560
vPOS SDK
2590
PROTOCOL CLASS DLL
2570
2580
GATEWAY SERVER

FIG. 25

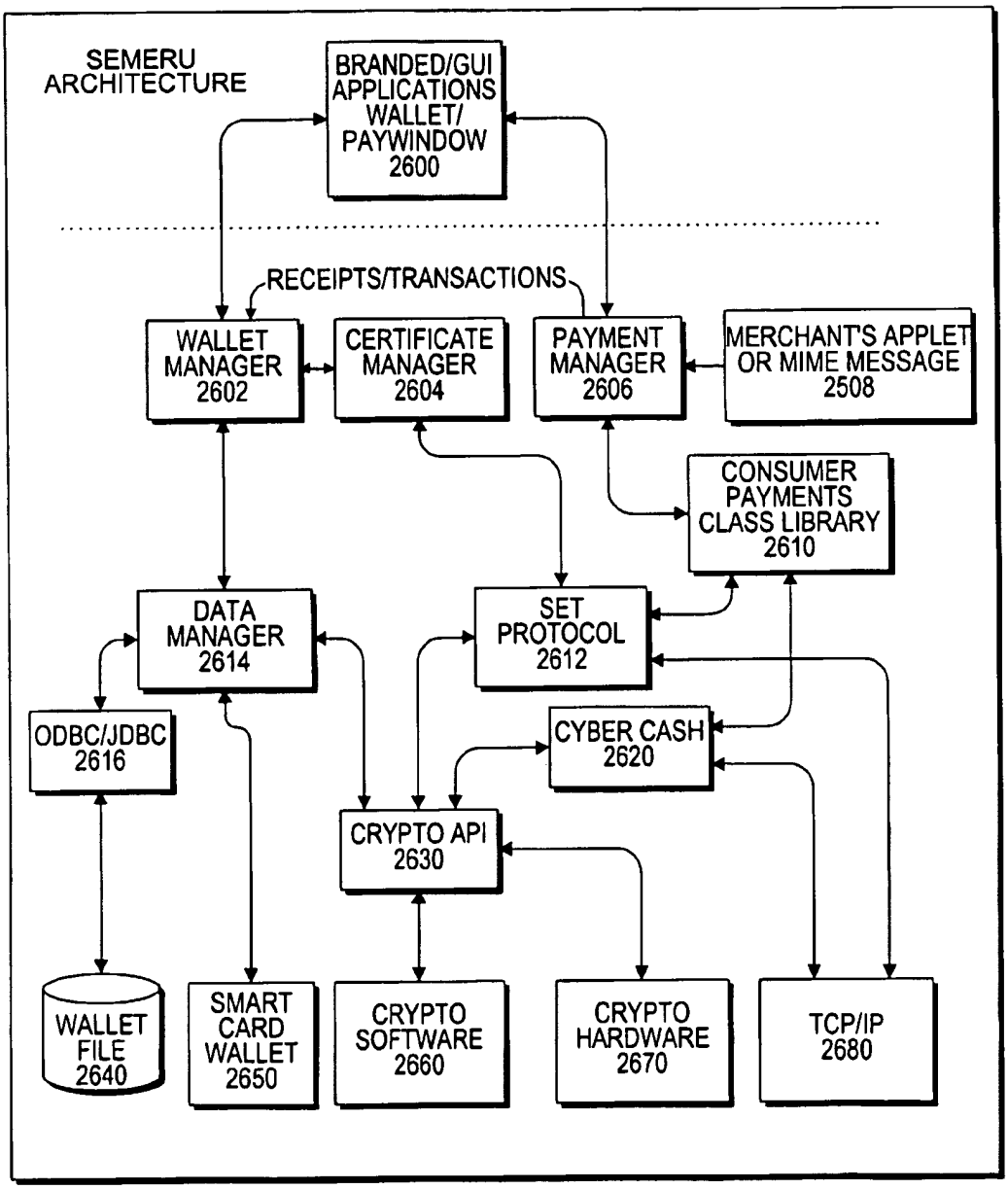

SEMERU ARCHITECTURE
BRANDED/GUI APPLICATIONS WALLET/ PAYWINDOW 2600
RECEIPTS/TRANSACTIONS
WALLET MANAGER 2602
CERTIFICATE MANAGER 2604
PAYMENT MANAGER 2606
MERCHANT'S APPLET OR MIME MESSAGE 2508
CONSUMER PAYMENTS CLASS LIBRARY 2610
DATA MANAGER 2614
SET PROTOCOL 2612
ODBC/JDBC 2616
CYBER CASH 2620
CRYPTO API 2630
WALLET FILE 2640
SMART CARD WALLET 2650
CRYPTO SOFTWARE 2660
CRYPTO HARDWARE 2670
TCP/IP 2680

FIG. 26

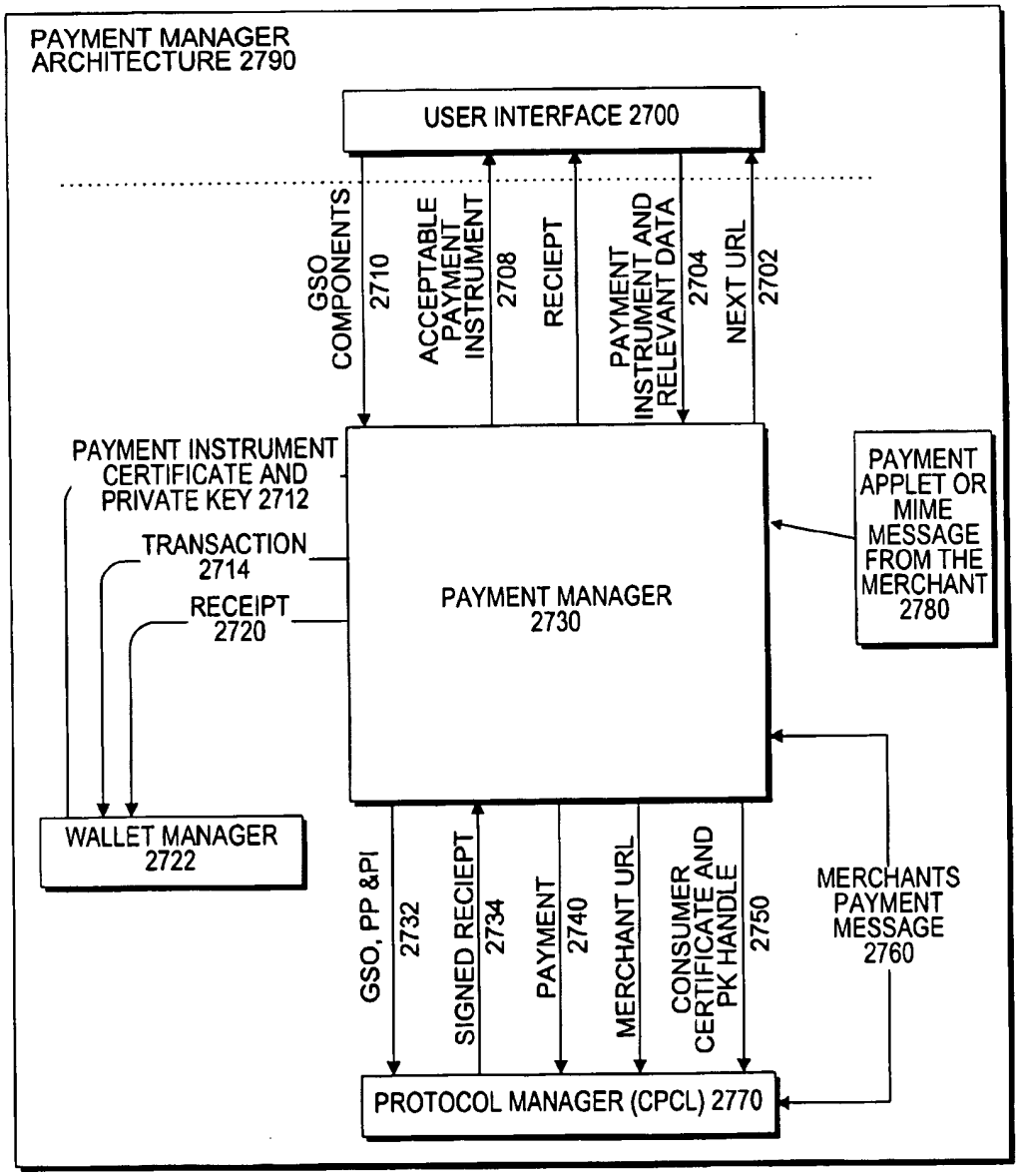

PAYMENT MANAGER ARCHITECTURE 2790
USER INTERFACE 2700
GSO COMPONENTS 2710
ACCEPTABLE PAYMENT INSTRUMENT 2708
RECIEPT
PAYMENT INSTRUMENT AND RELEVANT DATA 2704
NEXT URL 2702
PAYMENT INSTRUMENT CERTIFICATE AND PRIVATE KEY 2712
TRANSACTION 2714
RECEIPT 2720
PAYMENT MANAGER 2730
PAYMENT APPLET OR MIME MESSAGE FROM THE MERCHANT 2780
WALLET MANAGER 2722
GSO, PP &PI 2732
SIGNED RECIEPT 2734
PAYMENT 2740
MERCHANT URL
CONSUMER CERTIFICATE AND PK HANDLE 2750
MERCHANTS PAYMENT MESSAGE 2760
PROTOCOL MANAGER (CPCL) 2770

FIG. 27

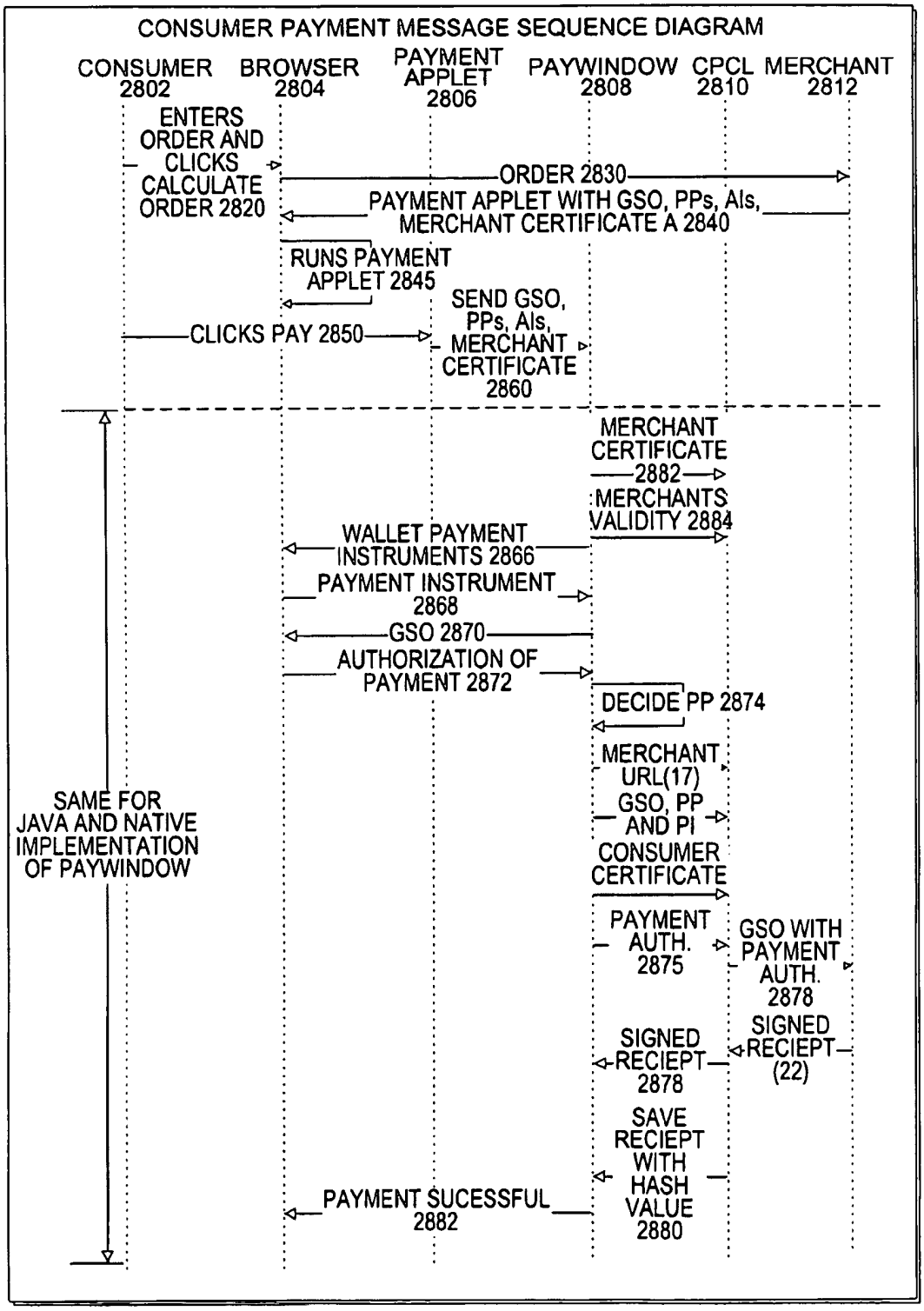

CONSUMER PAYMENT MESSAGE SEQUENCE DIAGRAM
CONSUMER 2802
BROWSER 2804
PAYMENT APPLET 2806
PAYWINDOW 2808
CPCL 2810
MERCHANT 2812
ENTERS ORDER AND CLICKS CALCULATE ORDER 2820
ORDER 2830
PAYMENT APPLET WITH GSO, PPs, AIs, MERCHANT CERTIFICATE A 2840
RUNS PAYMENT APPLET 2845
CLICKS PAY 2850
SEND GSO, PPs, AIs, MERCHANT CERTIFICATE 2860
MERCHANT CERTIFICATE 2882
MERCHANTS VALIDITY 2884
WALLET PAYMENT INSTRUMENTS 2866
PAYMENT INSTRUMENT 2868
GSO 2870
AUTHORIZATION OF PAYMENT 2872
DECIDE PP 2874
MERCHANT URL(17)
GSO, PP AND PI
CONSUMER CERTIFICATE
PAYMENT AUTH. 2875
GSO WITH PAYMENT AUTH. 2878
SIGNED RECIEPT 2878
SIGNED RECIEPT (22)
SAVE RECIEPT WITH HASH VALUE 2880
PAYMENT SUCESSFUL 2882
SAME FOR JAVA AND NATIVE IMPLEMENTATION OF PAYWINDOW

FIG. 28

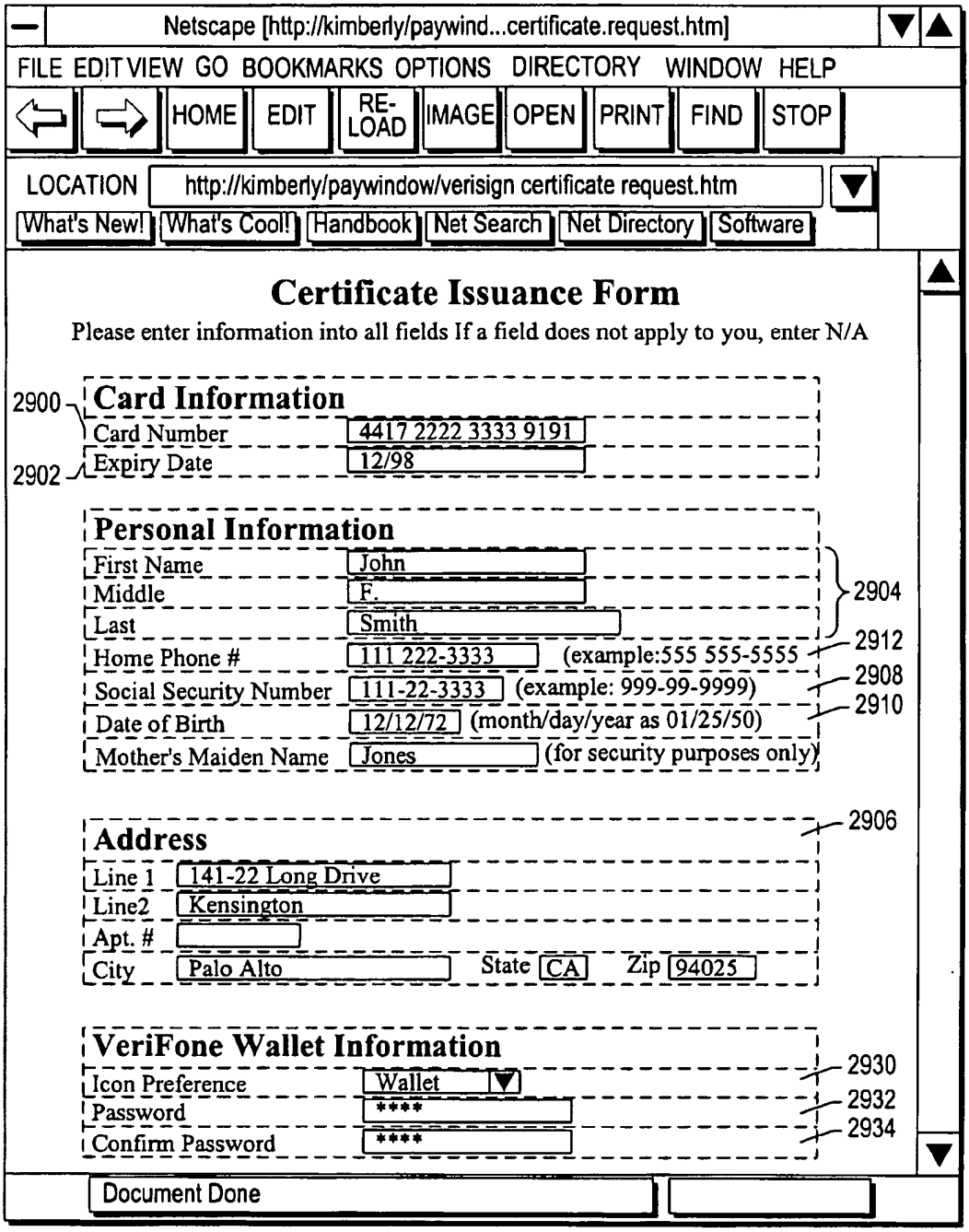

Netscape [http://kimberly/paywind...certificate.request.htm]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://kimberly/paywindow/verisign certificate request.htm
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
Certificate Issuance Form
Please enter information into all fields If a field does not apply to you, enter N/A
2900
Card Information
Card Number
4417 2222 3333 9191
2902
Expiry Date
12/98
Personal Information
First Name
John
Middle
F.
Last
Smith
2904
Home Phone #
111 222-3333
(example:555 555-5555
2912
Social Security Number
111-22-3333
(example: 999-99-9999)
2908
Date of Birth
12/12/72
(month/day/year as 01/25/50)
2910
Mother's Maiden Name
Jones
(for security purposes only)
2906
Address
Line 1
141-22 Long Drive
Line2
Kensington
Apt. #
City
Palo Alto
State
CA
Zip
94025
VeriFone Wallet Information
Icon Preference
Wallet
2930
Password
****
2932
Confirm Password
****
2934
Document Done

FIG. 29

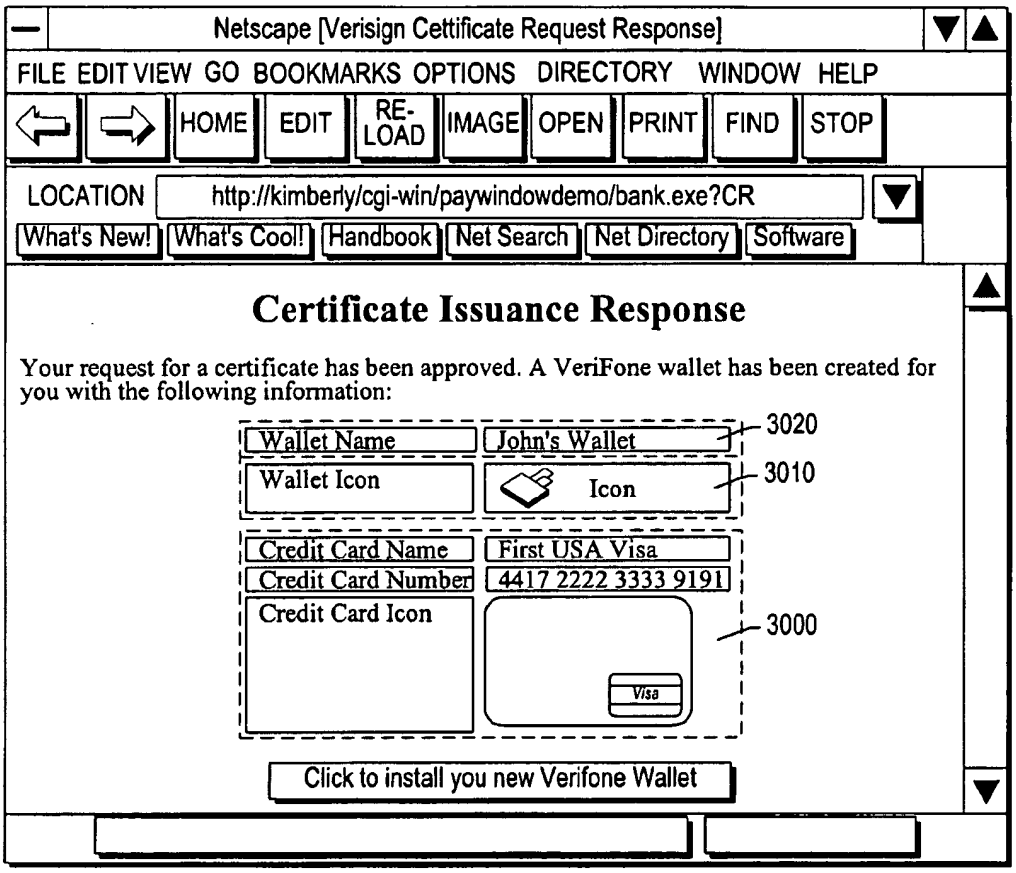

Netscape [Verisign Cettificate Request Response]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://kimberly/cgi-win/paywindowdemo/bank.exe?CR
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
Certificate Issuance Response
Your request for a certificate has been approved. A VeriFone wallet has been created for you with the following information:
Wallet Name
John's Wallet
3020
Wallet Icon
Icon
3010
Credit Card Name
First USA Visa
Credit Card Number
4417 2222 3333 9191
Credit Card Icon
Visa
3000
Click to install you new Verifone Wallet

FIG. 30

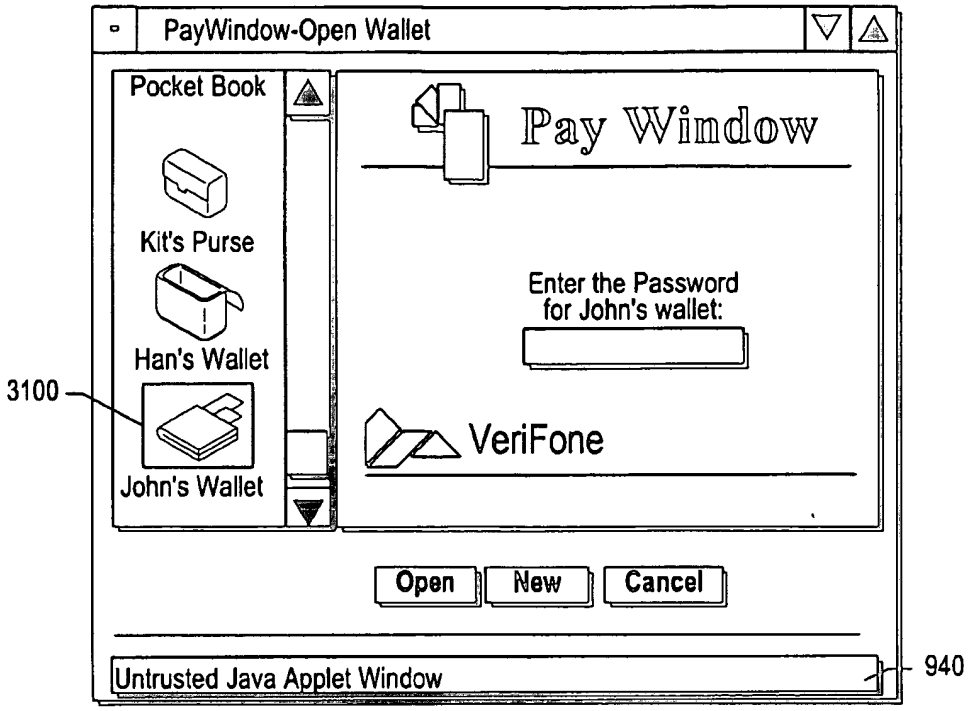

PayWindow-Open Wallet
Pocket Book
Kit's Purse
Han's Wallet
John's Wallet
3100
Pay Window
Enter the Password
for John's wallet:
VeriFone
Open
New
Cancel
Untrusted Java Applet Window
940

FIG. 31

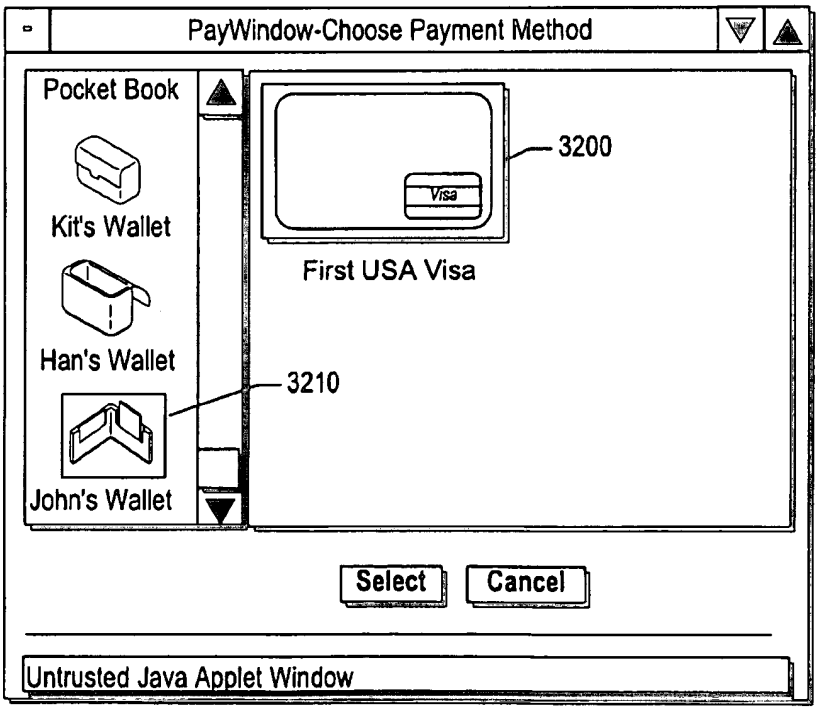

PayWindow-Choose Payment Method
Pocket Book
Kit's Wallet
Han's Wallet
John's Wallet
3210
3200
Visa
First USA Visa
Select
Cancel
Untrusted Java Applet Window

FIG. 32

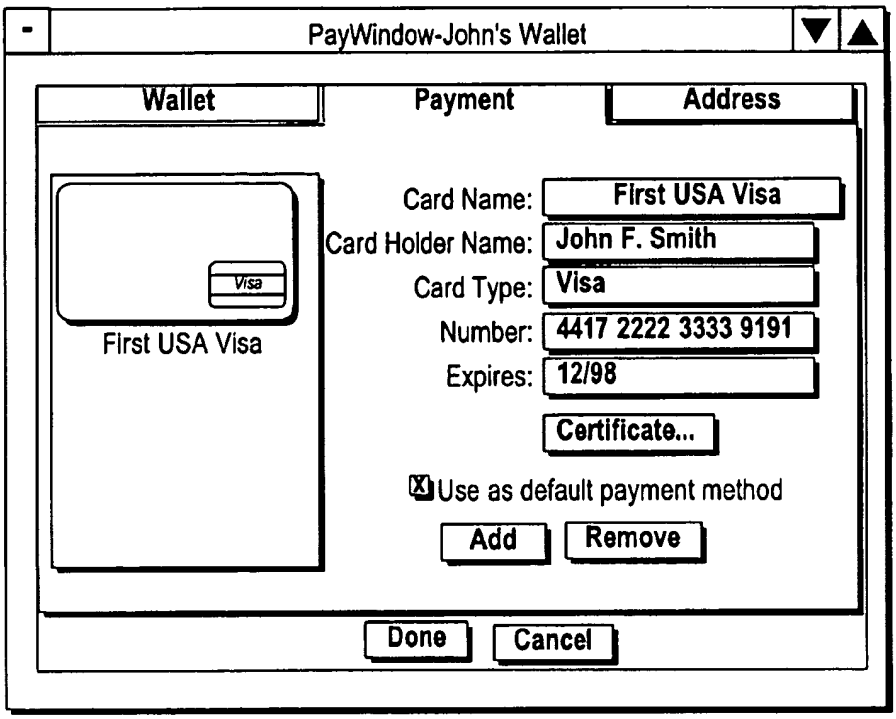

PayWindow-John's Wallet
Wallet
Payment
Address
Visa
First USA Visa
Card Name: First USA Visa
Card Holder Name: John F. Smith
Card Type: Visa
Number: 4417 2222 3333 9191
Expires: 12/98
Certificate...
Use as default payment method
Add
Remove
Done
Cancel

FIG. 33

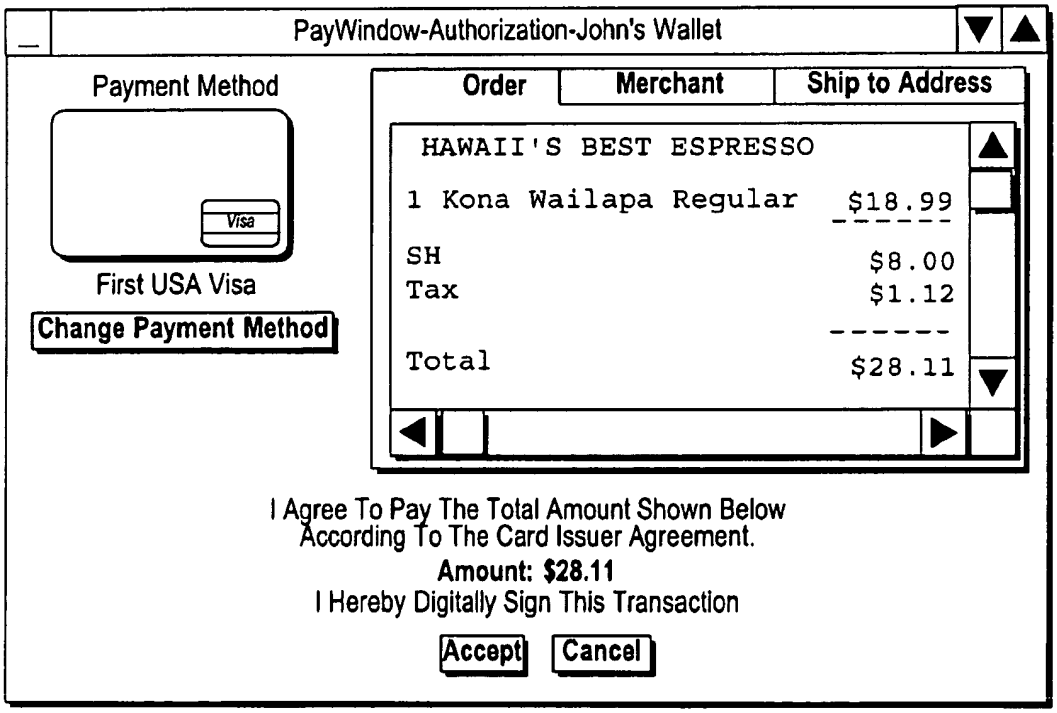

PayWindow-Authorization-John's Wallet
Payment Method
Visa
First USA Visa
Change Payment Method
Order
Merchant
Ship to Address
HAWAII'S BEST ESPRESSO
1 Kona Wailapa Regular $18.99
SH $8.00
Tax $1.12
Total $28.11
I Agree To Pay The Total Amount Shown Below
According To The Card Issuer Agreement.
Amount: $28.11
I Hereby Digitally Sign This Transaction
Accept
Cancel

FIG. 34

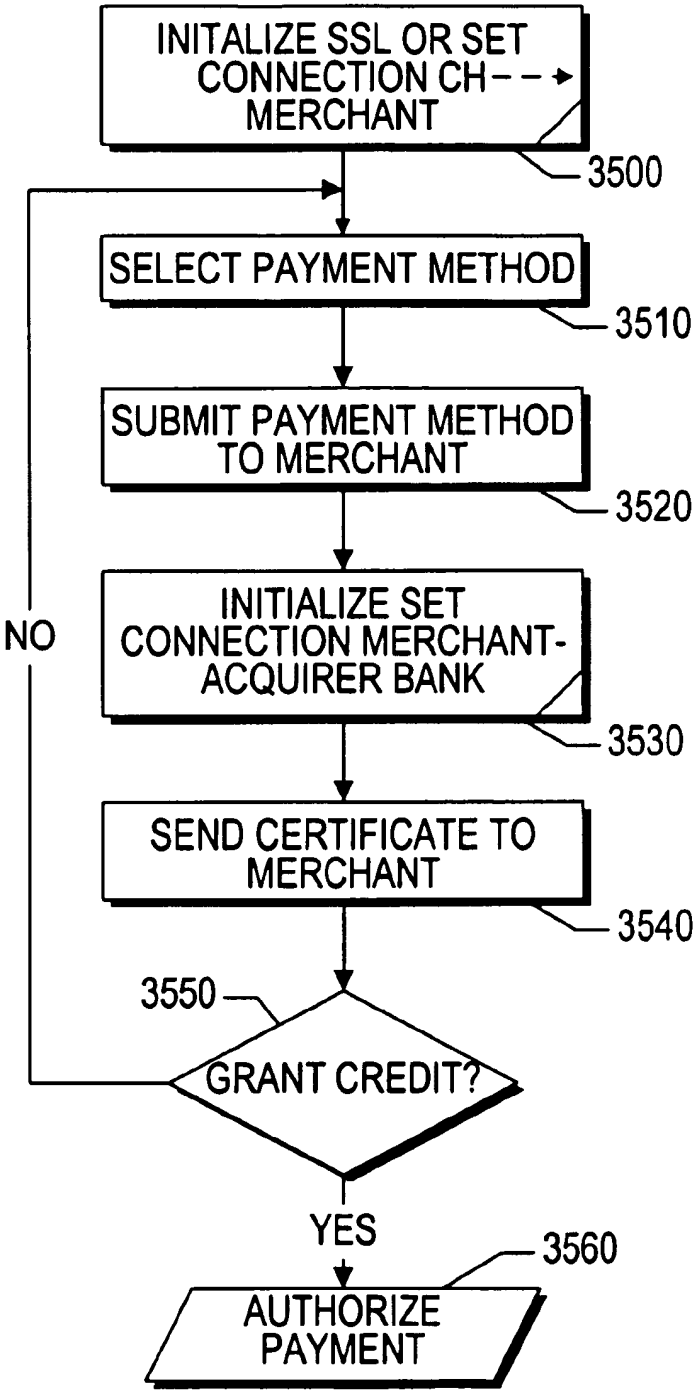

INITALIZE SSL OR SET CONNECTION CH- - - MERCHANT
3500
SELECT PAYMENT METHOD
3510
SUBMIT PAYMENT METHOD TO MERCHANT
3520
INITIALIZE SET CONNECTION MERCHANT-ACQUIRER BANK
3530
SEND CERTIFICATE TO MERCHANT
3540
3550
GRANT CREDIT?
NO
YES
3560
AUTHORIZE PAYMENT

FIG. 35

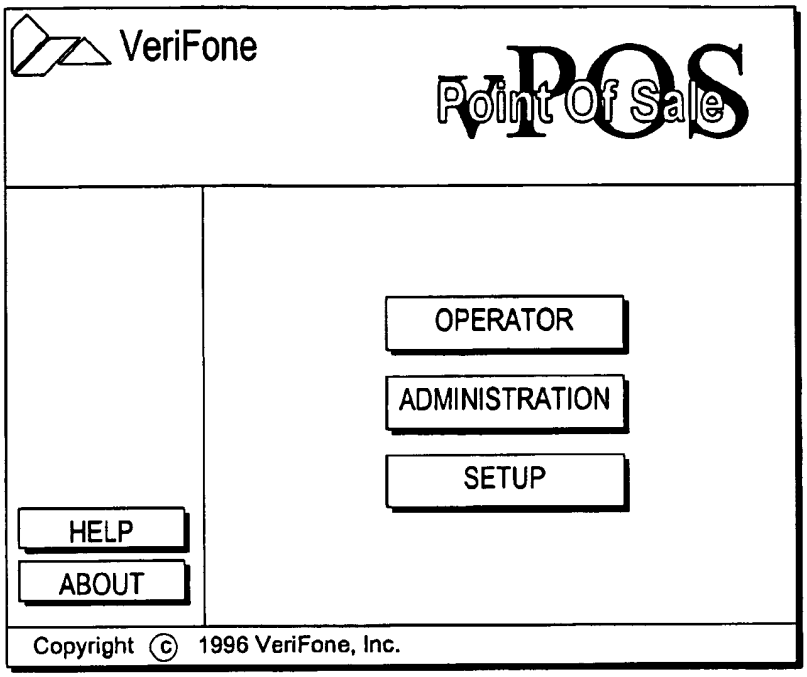

VeriFone
VPOS
Point Of Sale
OPERATOR
ADMINISTRATION
SETUP
HELP
ABOUT
Copyright © 1996 VeriFone, Inc.

FIG. 36

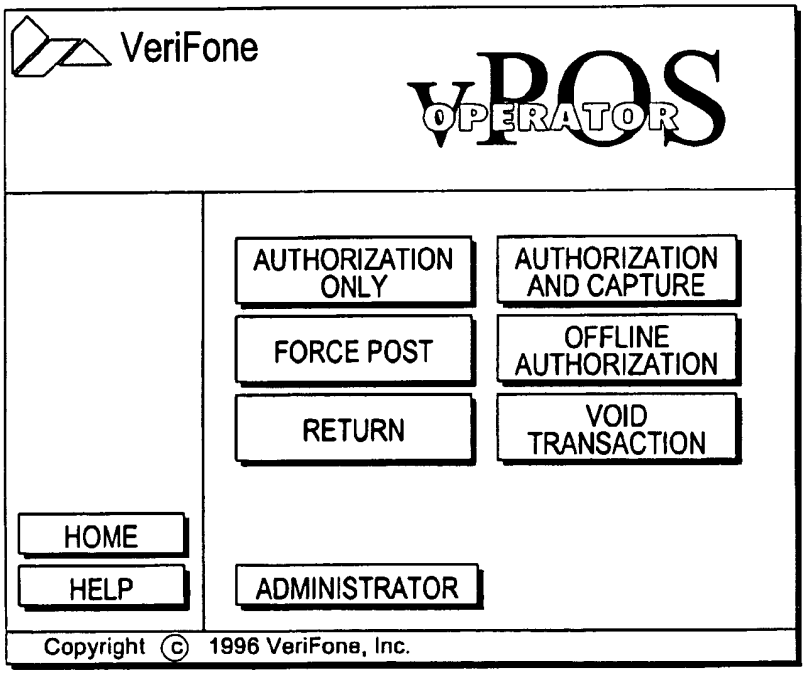

VeriFone
VPOS
OPERATOR
AUTHORIZATION ONLY
AUTHORIZATION AND CAPTURE
FORCE POST
OFFLINE AUTHORIZATION
RETURN
VOID TRANSACTION
HOME
HELP
ADMINISTRATOR
Copyright © 1996 VeriFone, Inc.

FIG. 37

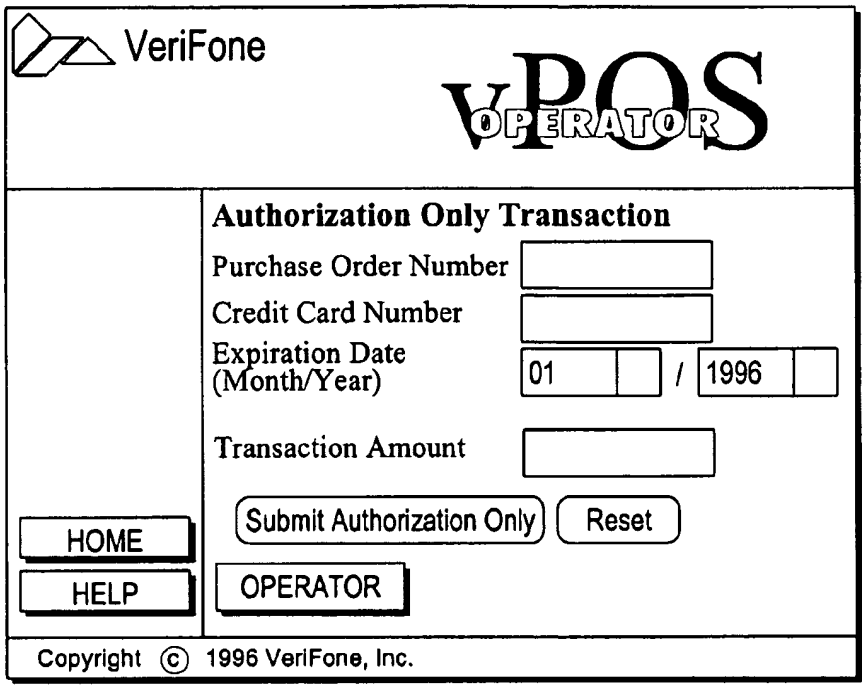

VeriFone
VPOS
OPERATOR
Authorization Only Transaction
Purchase Order Number
Credit Card Number
Expiration Date (Month/Year)
01
/
1996
Transaction Amount
Submit Authorization Only
Reset
HOME
HELP
OPERATOR
Copyright © 1996 VeriFone, Inc.

FIG. 38

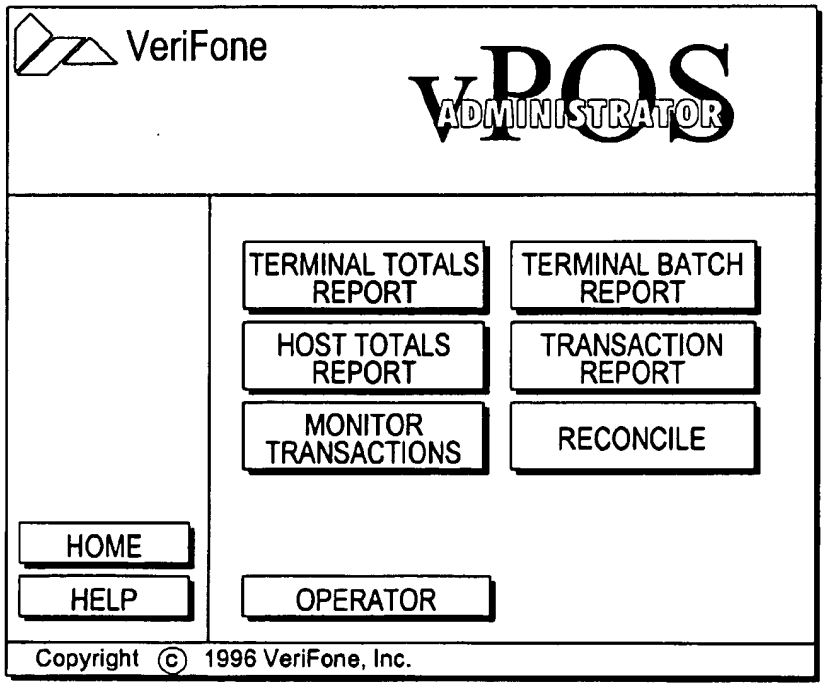
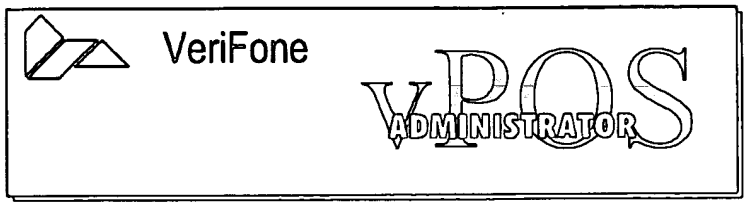

VeriFone
VPOS
ADMINISTRATOR
TERMINAL TOTALS REPORT
TERMINAL BATCH REPORT
HOST TOTALS REPORT
TRANSACTION REPORT
MONITOR TRANSACTIONS
RECONCILE
HOME
HELP
OPERATOR
Copyright © 1996 VeriFone, Inc.

FIG. 39



Terminal Totals Report

Note: The transaction is not currently implemented. The report below is a sample.

Overall Terminal Totals		
Sales	Trans. Count	25
	Amount	$6161.70
Credits	Trans. Count	5
	Amount	($11.70)
Net Sales		$6150.70

Visa Totals		
Sales	Num. of Trans.	5
	Amount	$1232.34
Credits	Num. of Trans.	1
	Amount	($2.34)
Net Sales		$1230.00

MasterCard Totals		
Sales	Trans. Count	5
	Amount	$1232.34
Credits	Trans. Count	1
	Amount	($2.34)
Net Sales		$1230.00

Discover Totals		
Sales	Num. of Trans.	5
	Amount	$1232.34
Credits	Num. of Trans.	1
	Amount	($2.34)
Net Sales		$1230.00

American Express Totals		
Sales	Num. of Trans.	5
	Amount	$1232.34
Credits	Num. of Trans.	1
	Amount	($2.34)
Net Sales		$1230.00

FIG. 40

JCB Totals		
Sales	Num. of Trans.	5
	Amount	$1232.34
Credits	Num. of Trans.	1
	Amount	($2.34)
Net Sales		$1230.00

ADMINISTRATOR

FIG. 41

VeriFone VPOS Point Of Sale

Terminal Setup

Terminal Tables Configuration

Card(s) Definition Table	Review
Acquirer(s) Definition Table	Review
Merchant Configuration Table	Review

Help

FIG. 42

VeriFone VPOS OPERATOR

Terminal Type CDT List Update/Review

Cards acepted by the merchant

Visa

FIG. 43

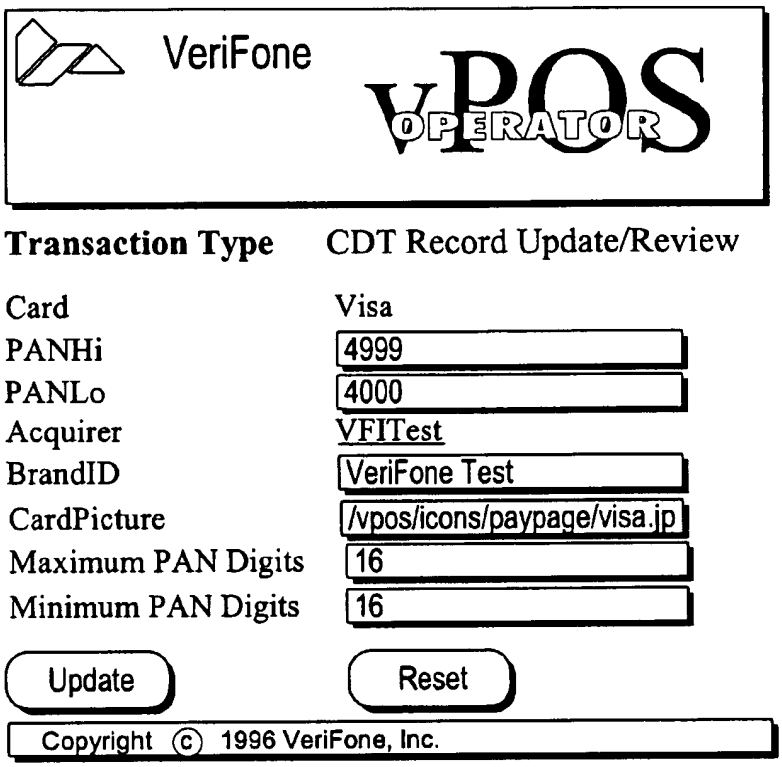

VeriFone
VPOS
OPERATOR
Transaction Type CDT Record Update/Review
Card Visa
PANHi 4999
PANLo 4000
Acquirer VFITest
BrandID VeriFone Test
CardPicture /vpos/icons/paypage/visa.jp
Maximum PAN Digits 16
Minimum PAN Digits 16
Update
Reset
Copyright © 1996 VeriFone, Inc.

FIG. 44

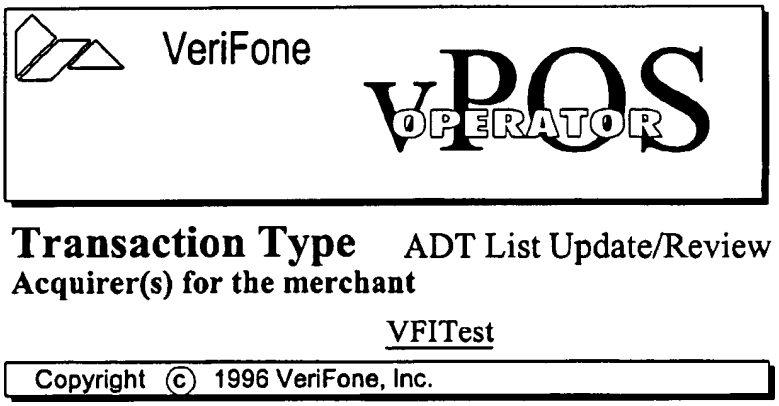

VeriFone
VPOS
OPERATOR
Transaction Type ADT List Update/Review
Acquirer(s) for the merchant
VFITest
Copyright © 1996 VeriFone, Inc.

FIG. 45

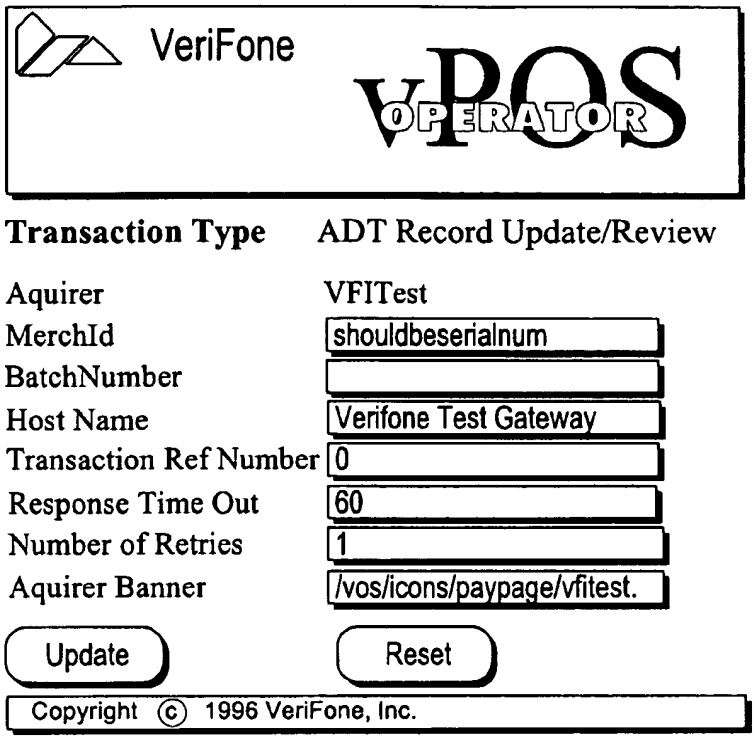

VeriFone
VPOS
OPERATOR
Transaction Type
ADT Record Update/Review
Aquirer
VFITest
MerchId
shouldbeserialnum
BatchNumber
Host Name
Verifone Test Gateway
Transaction Ref Number
0
Response Time Out
60
Number of Retries
1
Aquirer Banner
/vos/icons/paypage/vfitest.
Update
Reset
Copyright © 1996 VeriFone, Inc.

FIG. 46

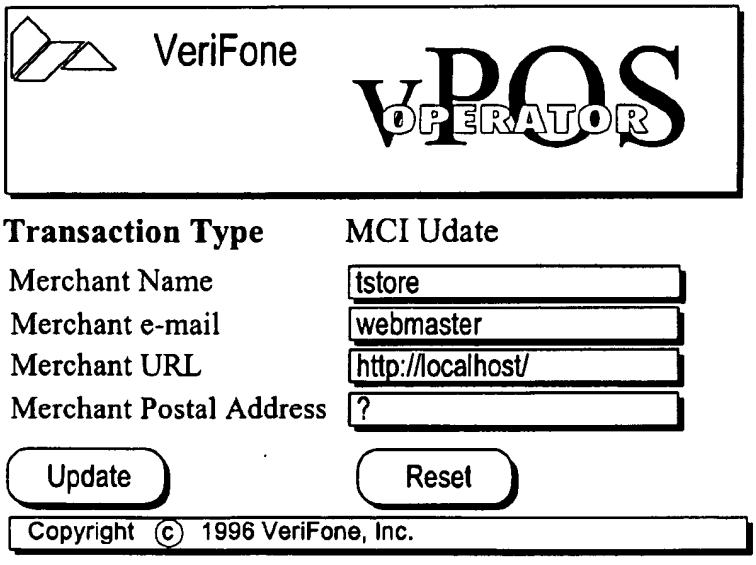

VeriFone
VPOS
OPERATOR
Transaction Type
MCI Udate
Merchant Name
tstore
Merchant e-mail
webmaster
Merchant URL
http://localhost/
Merchant Postal Address
?
Update
Reset
Copyright © 1996 VeriFone, Inc.

FIG. 47

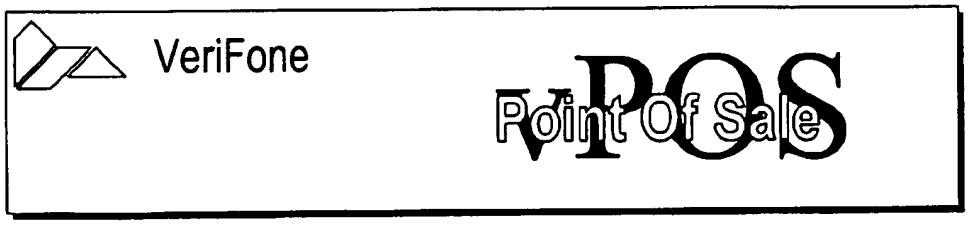

VeriFone
VPOS
Point Of Sale
Order Number834100050
Bill To
Account Number
VISA
Name on Card
Good Through
Address Line 1
Address Line 2
City
State/Province
Country
Zip/Postal Code
Email
Phone
If you wish to have billing defaults set in your browser, check this box
Total=$59.99
By pressing the PAY button I agree to pay the above total amount according to the card issuer agreement
RETURN TO SHOPPING
PAY

FIG. 48

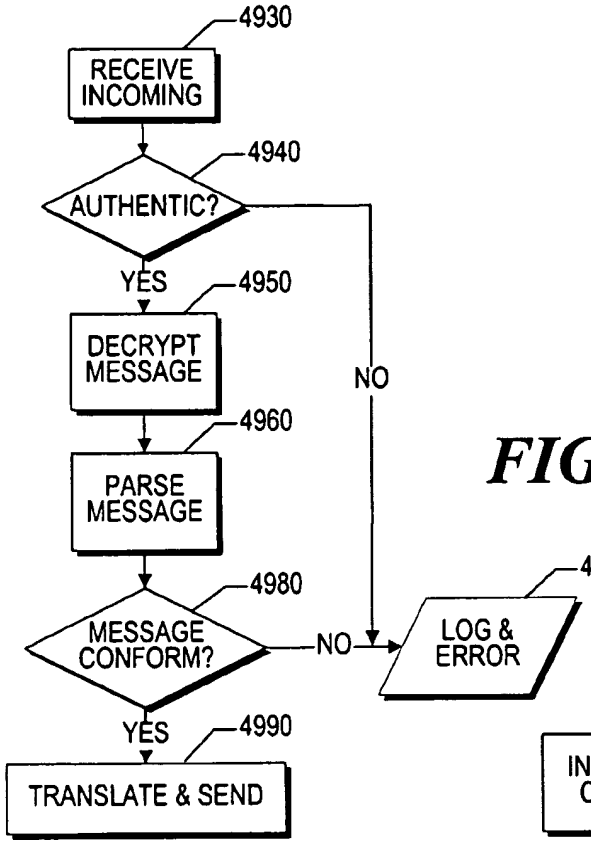

4930
RECEIVE INCOMING
4940
AUTHENTIC?
YES
NO
4950
DECRYPT MESSAGE
4960
PARSE MESSAGE
4980
MESSAGE CONFORM?
NO
4970
LOG & ERROR
YES
4990
TRANSLATE & SEND

FIG. 49

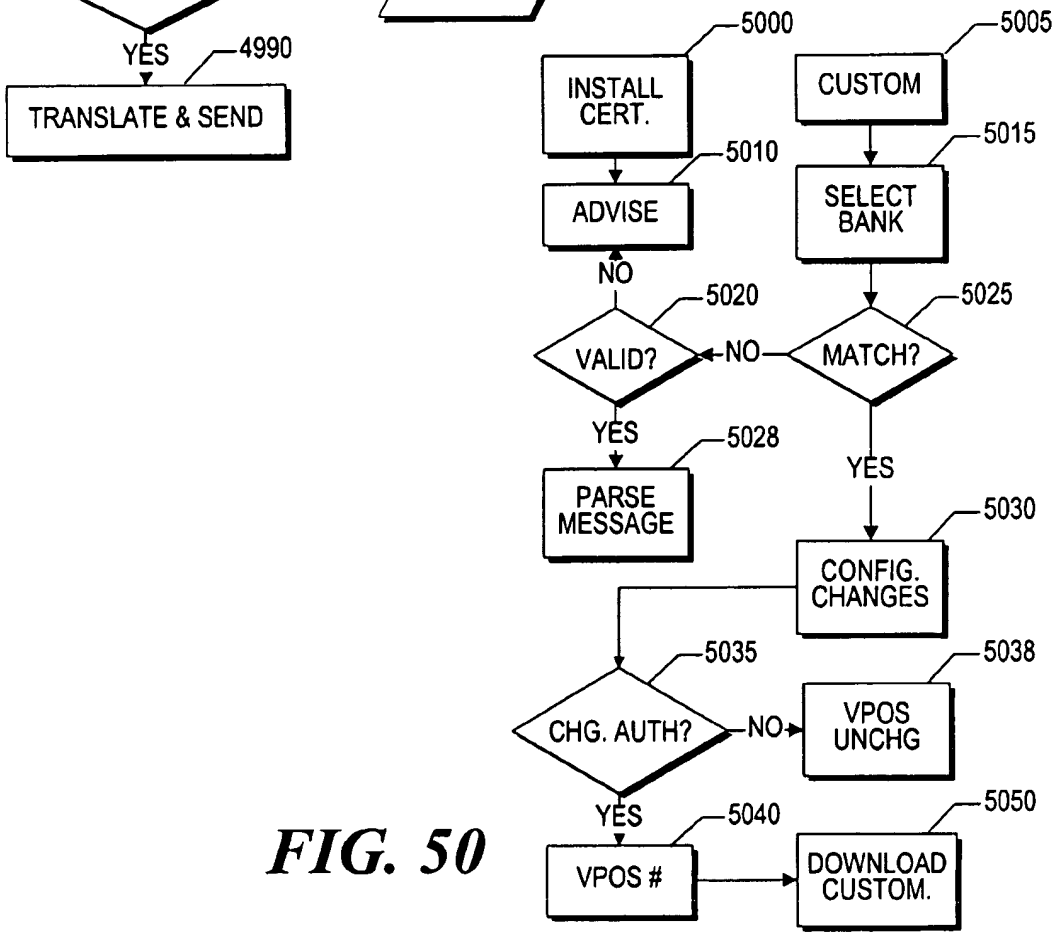

5000
INSTALL CERT.
5005
CUSTOM
5010
ADVISE
5015
SELECT BANK
NO
5020
VALID?
NO
5025
MATCH?
YES
5028
PARSE MESSAGE
YES
5030
CONFIG. CHANGES
5035
CHG. AUTH?
NO
5038
VPOS UNCHG
YES
5040
VPOS #
5050
DOWNLOAD CUSTOM.

FIG. 50

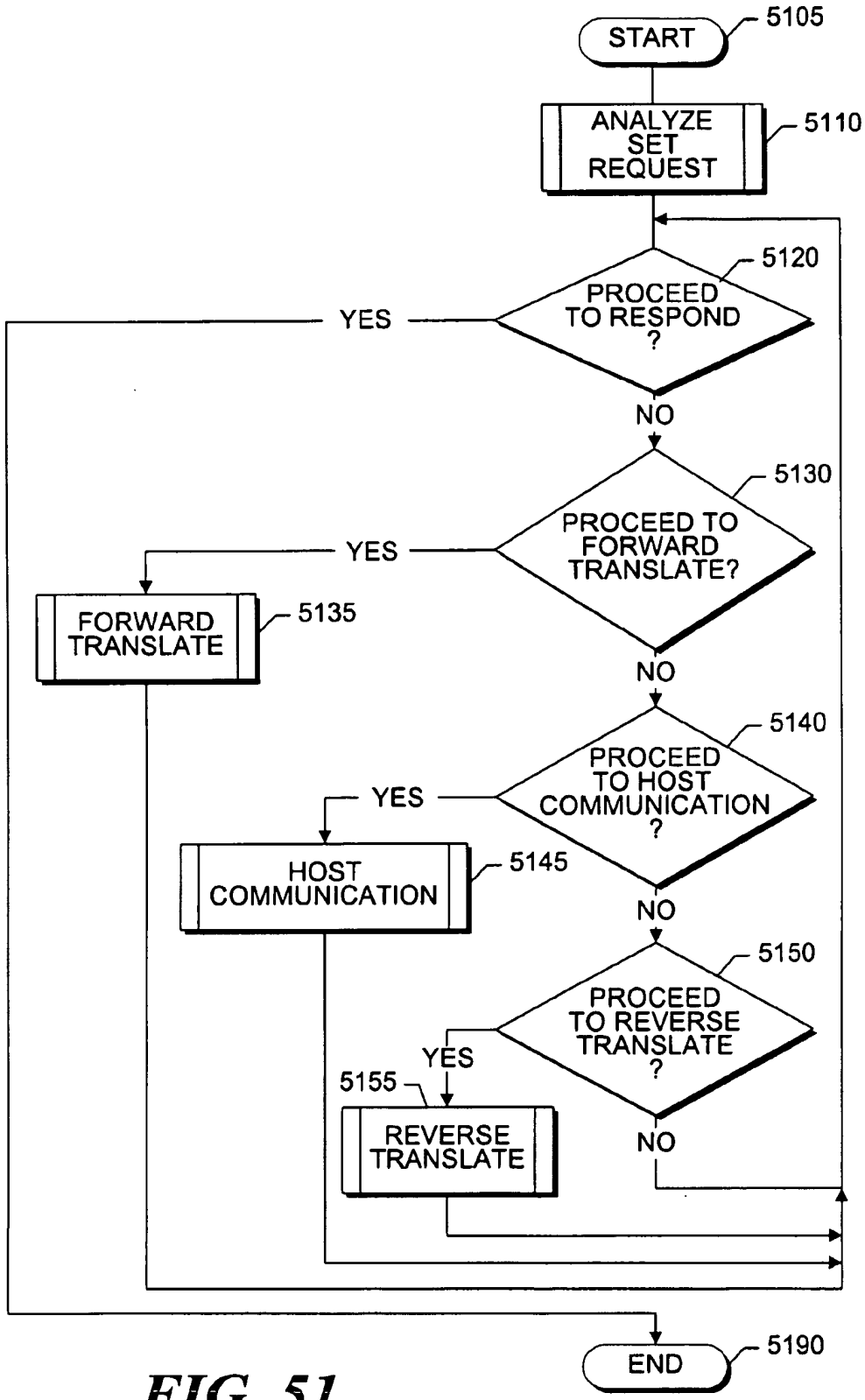

START
5105
ANALYZE SET REQUEST
5110
PROCEED TO RESPOND ?
5120
YES
NO
PROCEED TO FORWARD TRANSLATE?
5130
YES
FORWARD TRANSLATE
5135
NO
PROCEED TO HOST COMMUNICATION ?
5140
YES
HOST COMMUNICATION
5145
NO
PROCEED TO REVERSE TRANSLATE ?
5150
YES
5155
REVERSE TRANSLATE
NO
END
5190

FIG. 51

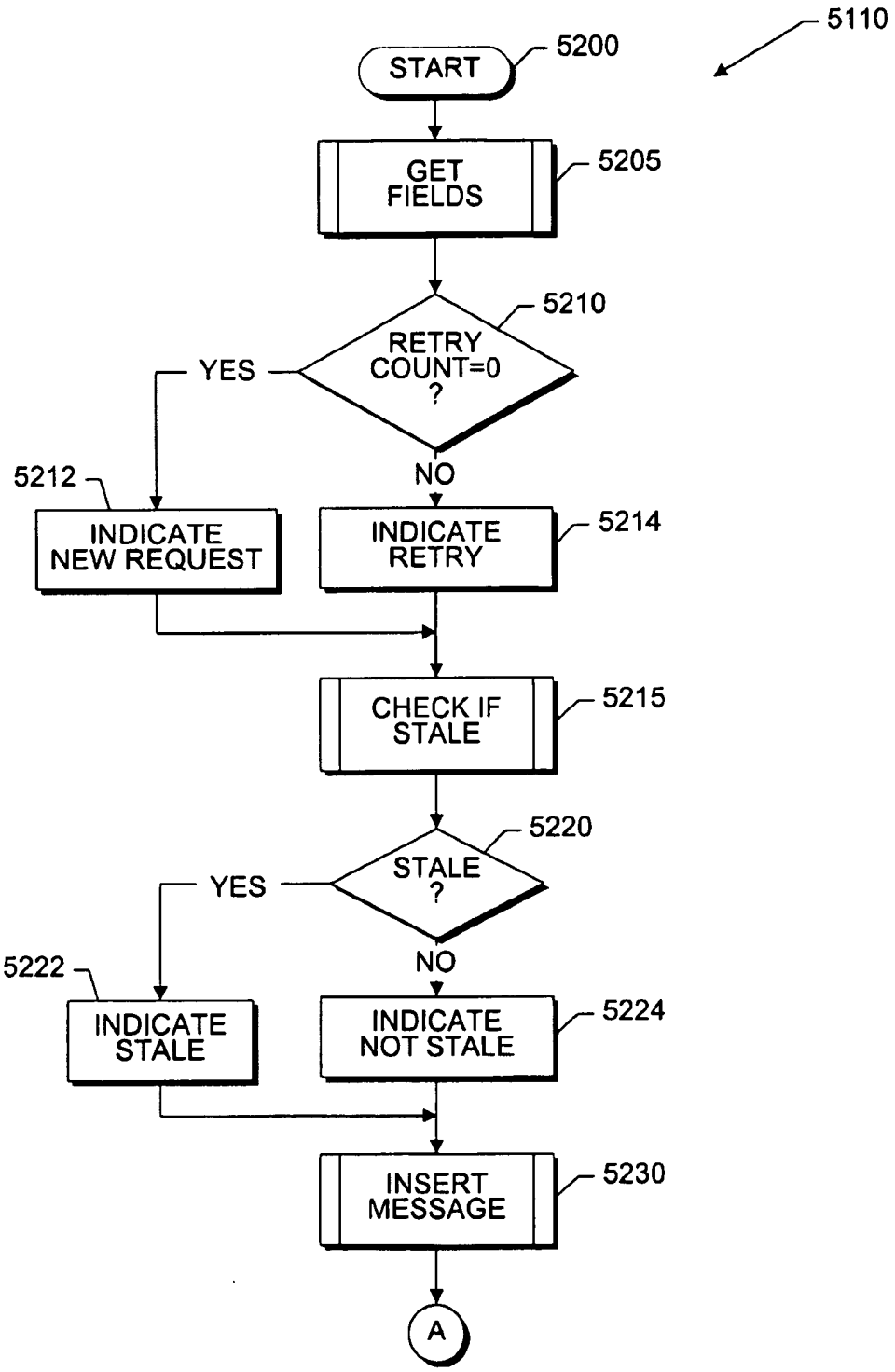

5110
START
5200
GET FIELDS
5205
RETRY COUNT=0 ?
5210
YES
NO
5212
INDICATE NEW REQUEST
INDICATE RETRY
5214
CHECK IF STALE
5215
STALE ?
5220
YES
NO
5222
INDICATE STALE
INDICATE NOT STALE
5224
INSERT MESSAGE
5230
A

FIG. 52A

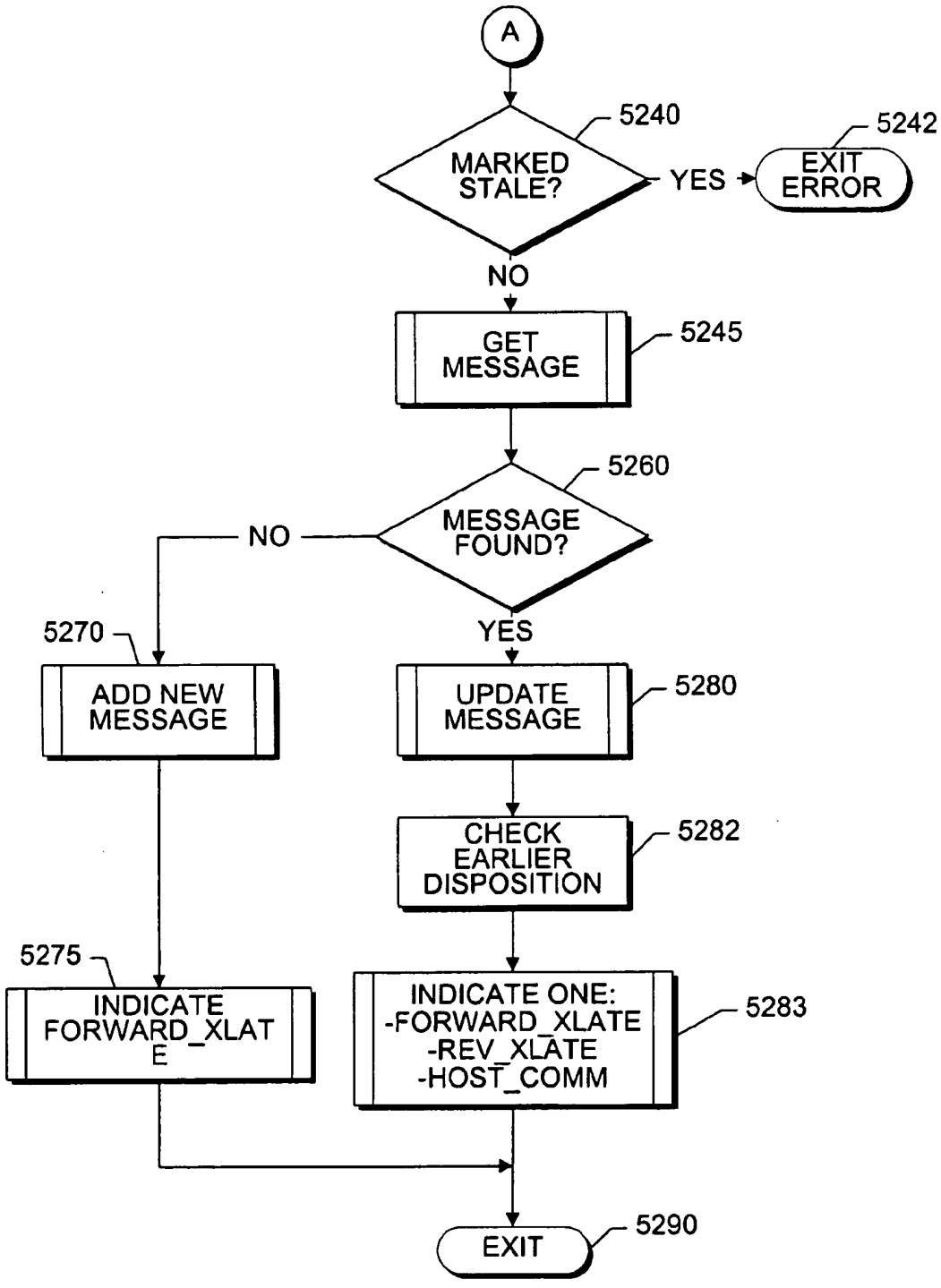

A
5240
MARKED STALE?
YES
5242
EXIT ERROR
NO
GET MESSAGE
5245
5260
MESSAGE FOUND?
NO
YES
5270
ADD NEW MESSAGE
UPDATE MESSAGE
5280
CHECK EARLIER DISPOSITION
5282
5275
INDICATE FORWARD_XLATE
INDICATE ONE:
-FORWARD_XLATE
-REV_XLATE
-HOST_COMM
5283
EXIT
5290

FIG. 52B

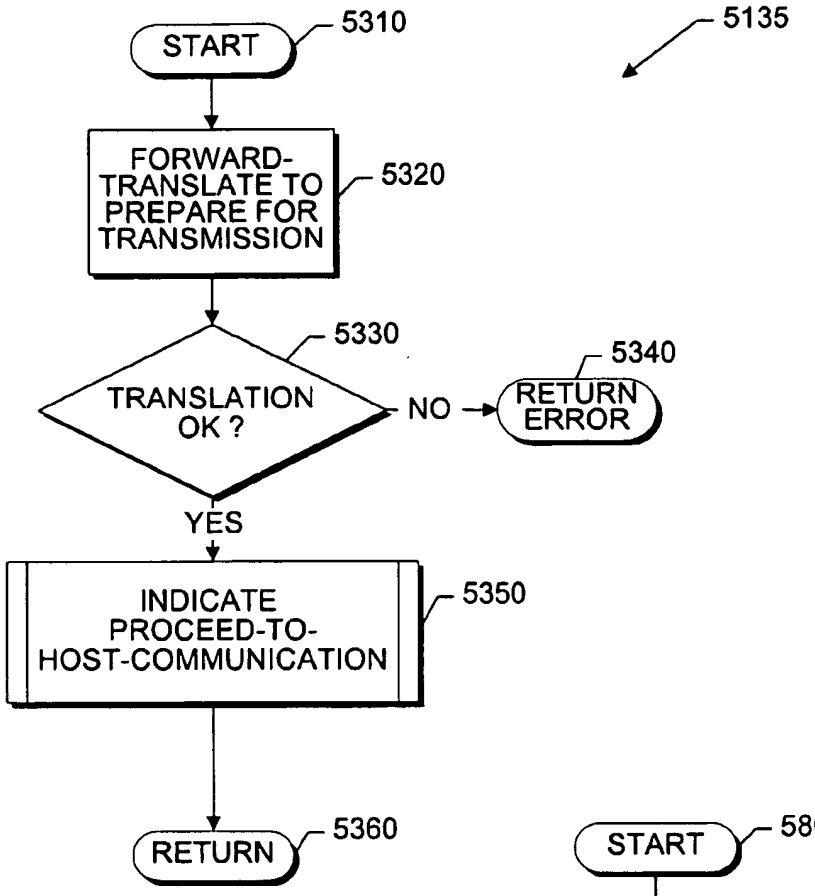

5135
START
5310
FORWARD-TRANSLATE TO PREPARE FOR TRANSMISSION
5320
TRANSLATION OK ?
5330
NO
RETURN ERROR
5340
YES
INDICATE PROCEED-TO-HOST-COMMUNICATION
5350
RETURN
5360

FIG. 53

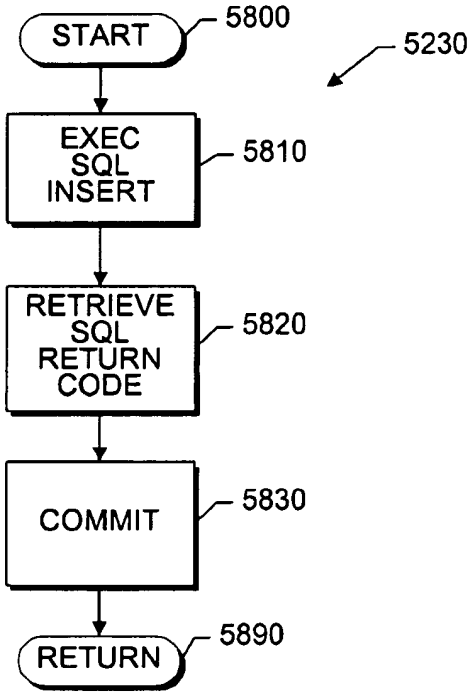

5230
START
5800
EXEC SQL INSERT
5810
RETRIEVE SQL RETURN CODE
5820
COMMIT
5830
RETURN
5890

FIG. 58

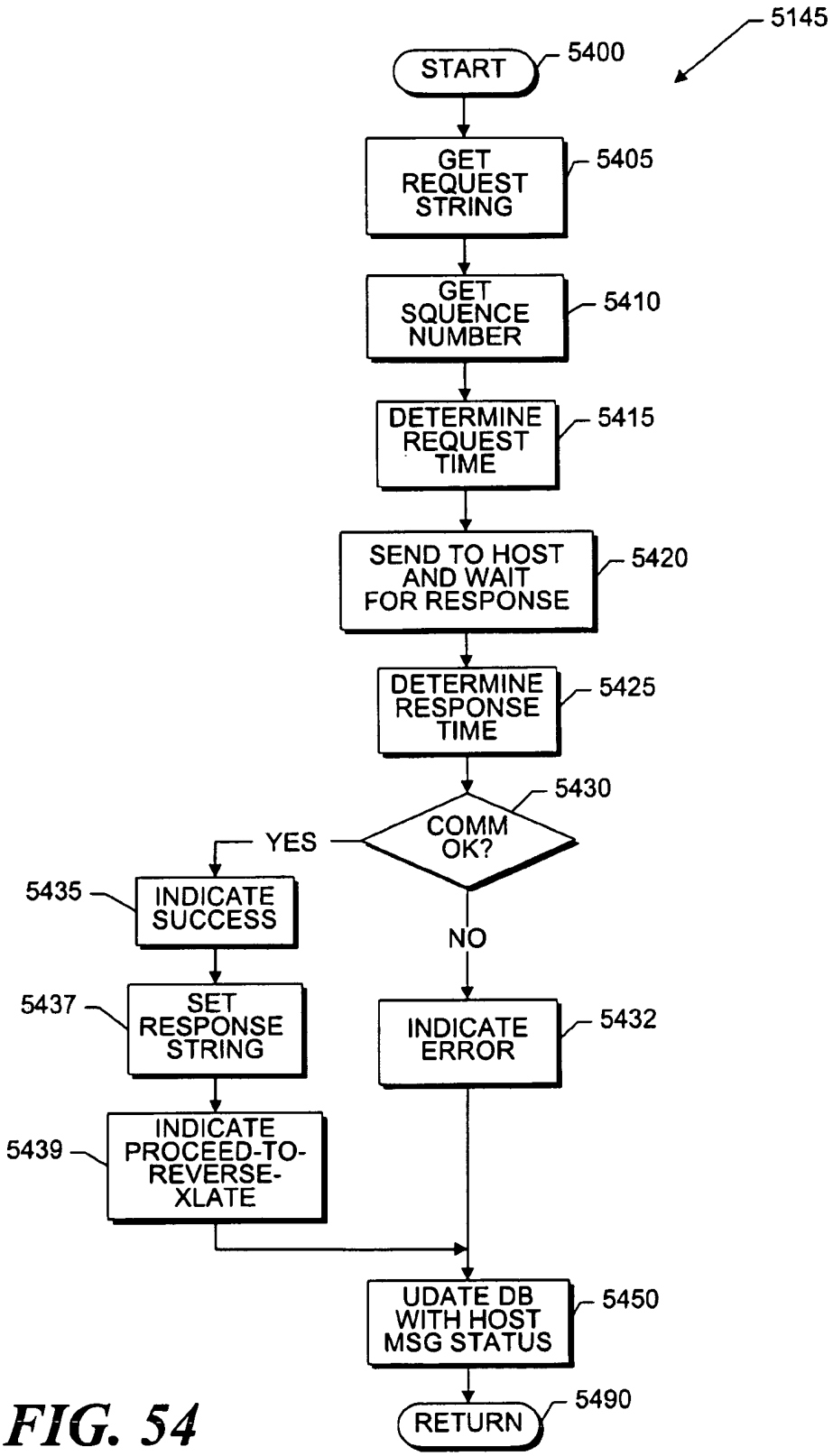

5145
START
5400
GET REQUEST STRING
5405
GET SQUENCE NUMBER
5410
DETERMINE REQUEST TIME
5415
SEND TO HOST AND WAIT FOR RESPONSE
5420
DETERMINE RESPONSE TIME
5425
COMM OK?
5430
YES
NO
5435
INDICATE SUCCESS
5437
SET RESPONSE STRING
5439
INDICATE PROCEED-TO-REVERSE-XLATE
INDICATE ERROR
5432
UDATE DB WITH HOST MSG STATUS
5450
RETURN
5490

FIG. 54

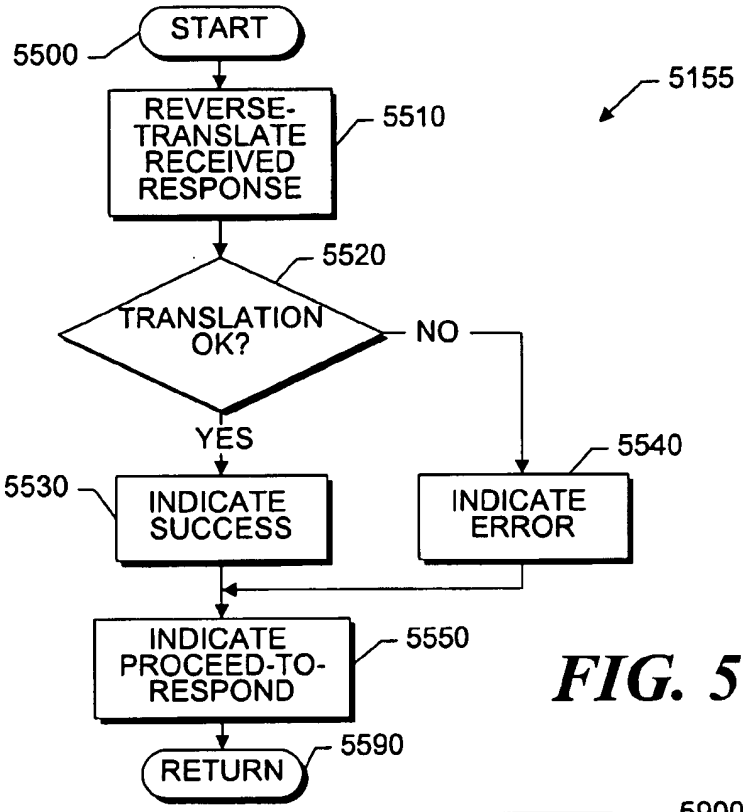

START
5500
5155
REVERSE-TRANSLATE RECEIVED RESPONSE
5510
5520
TRANSLATION OK?
NO
YES
5530
INDICATE SUCCESS
5540
INDICATE ERROR
INDICATE PROCEED-TO-RESPOND
5550
RETURN
5590

FIG. 55

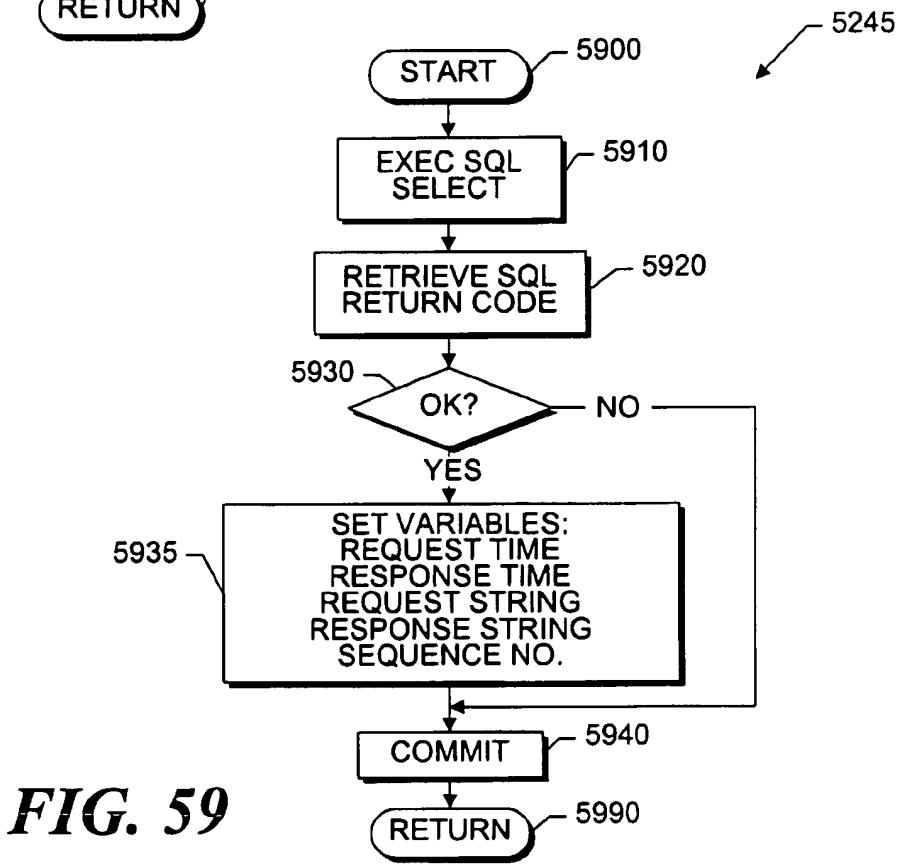

5245
START
5900
EXEC SQL SELECT
5910
RETRIEVE SQL RETURN CODE
5920
5930
OK?
NO
YES
5935
SET VARIABLES:
REQUEST TIME
RESPONSE TIME
REQUEST STRING
RESPONSE STRING
SEQUENCE NO.
COMMIT
5940
RETURN
5990

FIG. 59

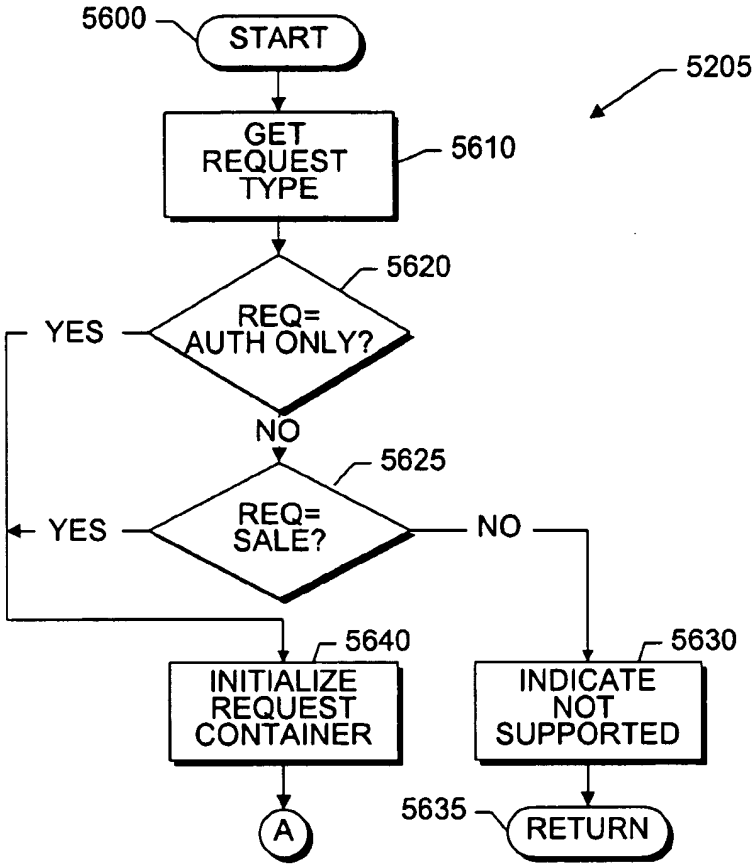


FIG. 56A

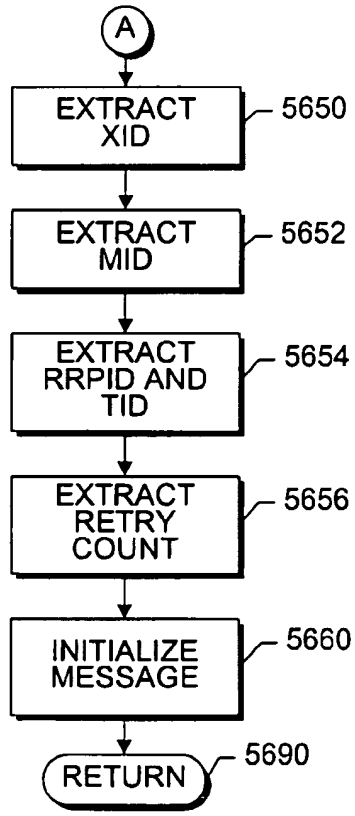


FIG. 56B

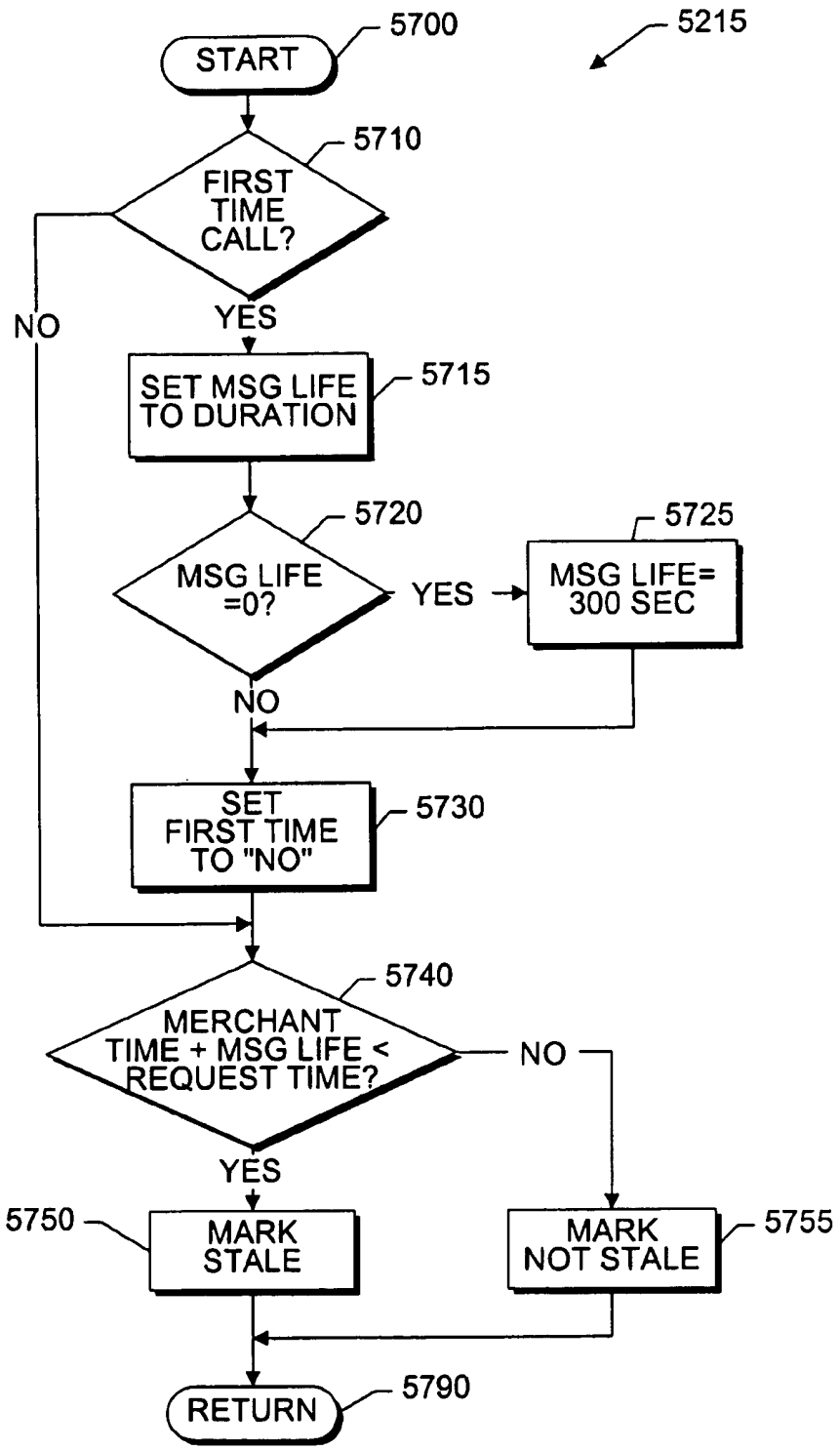

5700
START
5215
5710
FIRST TIME CALL?
NO
YES
SET MSG LIFE TO DURATION
5715
5720
MSG LIFE =0?
YES
5725
MSG LIFE= 300 SEC
NO
SET FIRST TIME TO "NO"
5730
5740
MERCHANT TIME + MSG LIFE < REQUEST TIME?
NO
YES
5750
MARK STALE
MARK NOT STALE
5755
RETURN
5790

FIG. 57

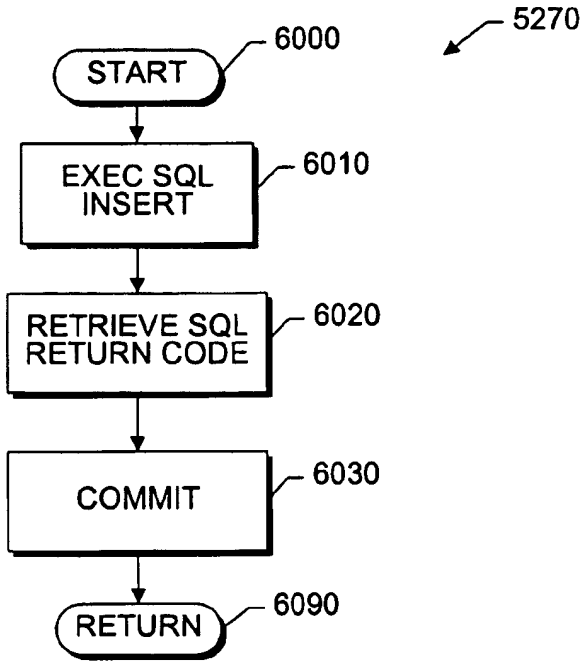

5270
START
6000
EXEC SQL INSERT
6010
RETRIEVE SQL RETURN CODE
6020
COMMIT
6030
RETURN
6090

FIG. 60

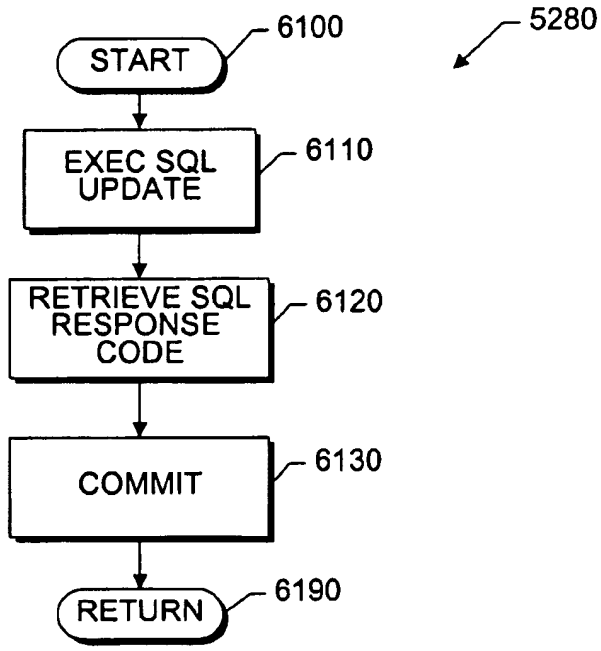

5280
START
6100
EXEC SQL UPDATE
6110
RETRIEVE SQL RESPONSE CODE
6120
COMMIT
6130
RETURN
6190

FIG. 61

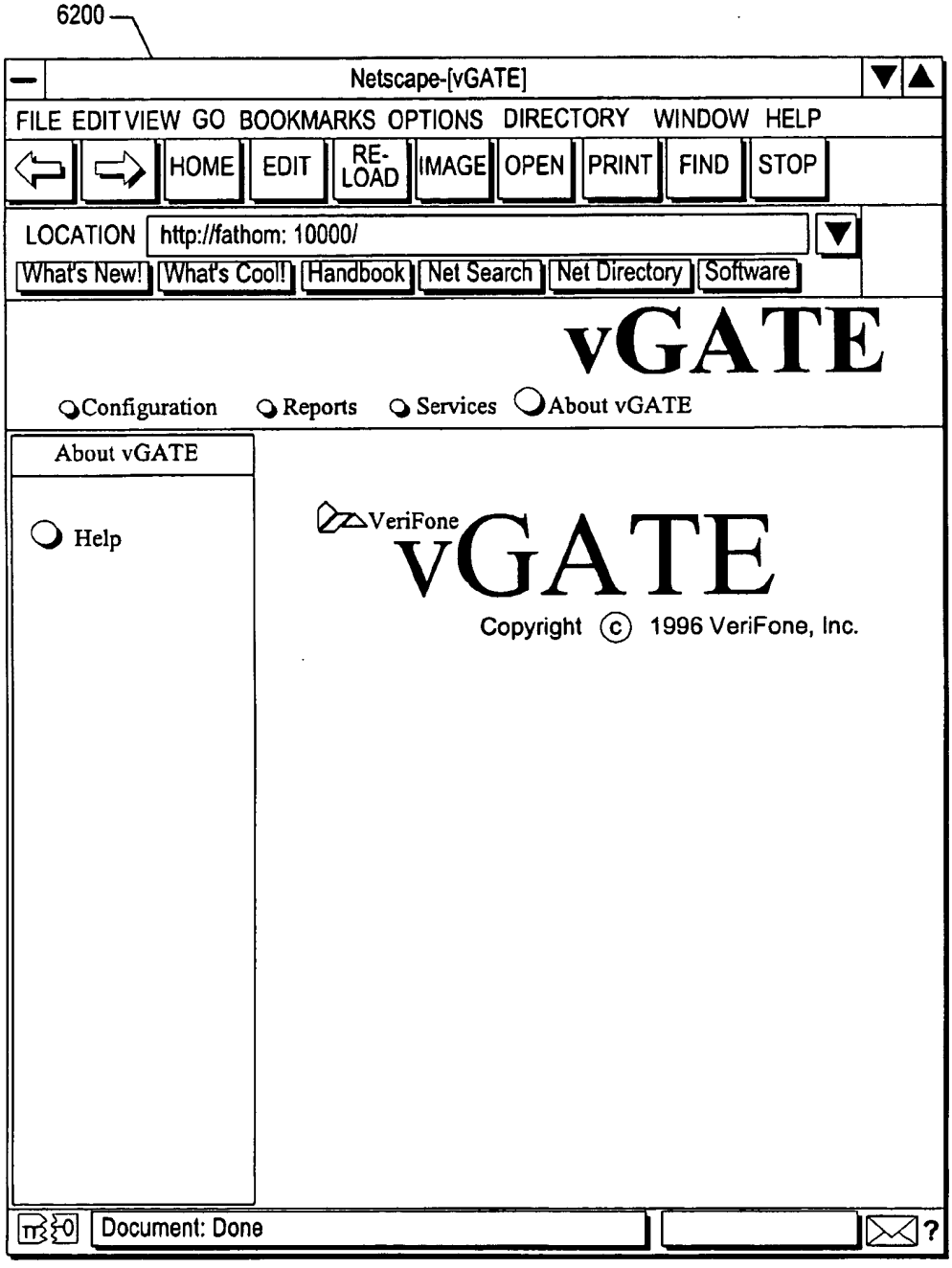

6200
Netscape-[vGATE]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://fathom: 10000/
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
vGATE
Configuration
Reports
Services
About vGATE
About vGATE
Help
VeriFone
vGATE
Copyright © 1996 VeriFone, Inc.
Document: Done

FIG. 62

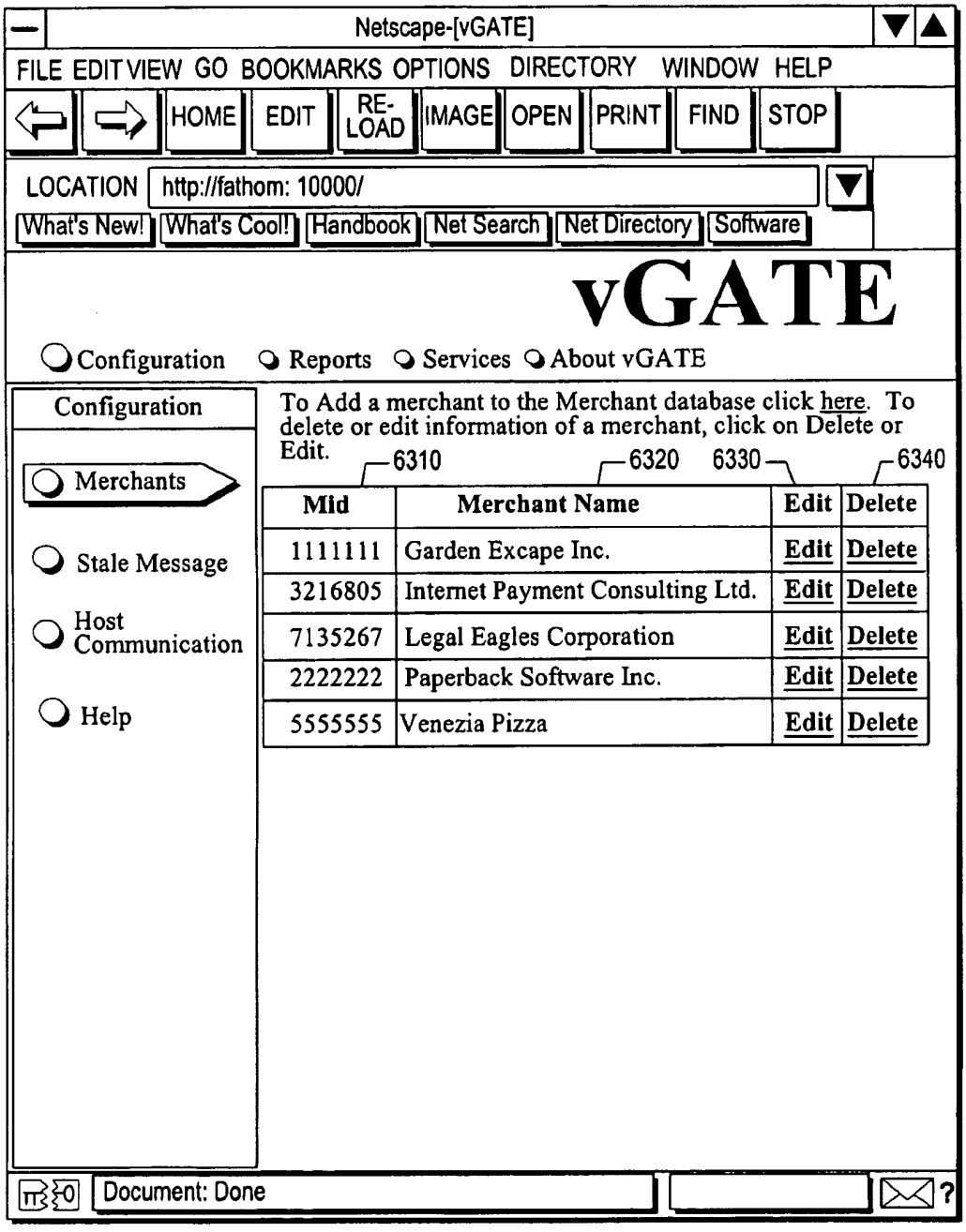

Netscape-[vGATE]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://fathom: 10000/
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
vGATE
Configuration
Reports
Services
About vGATE
Configuration
Merchants
Stale Message
Host Communication
Help
To Add a merchant to the Merchant database click here. To delete or edit information of a merchant, click on Delete or Edit.
6310
6320
6330
6340
Mid
Merchant Name
Edit
Delete
1111111
Garden Excape Inc.
3216805
Internet Payment Consulting Ltd.
7135267
Legal Eagles Corporation
2222222
Paperback Software Inc.
5555555
Venezia Pizza
Document: Done

FIG. 63

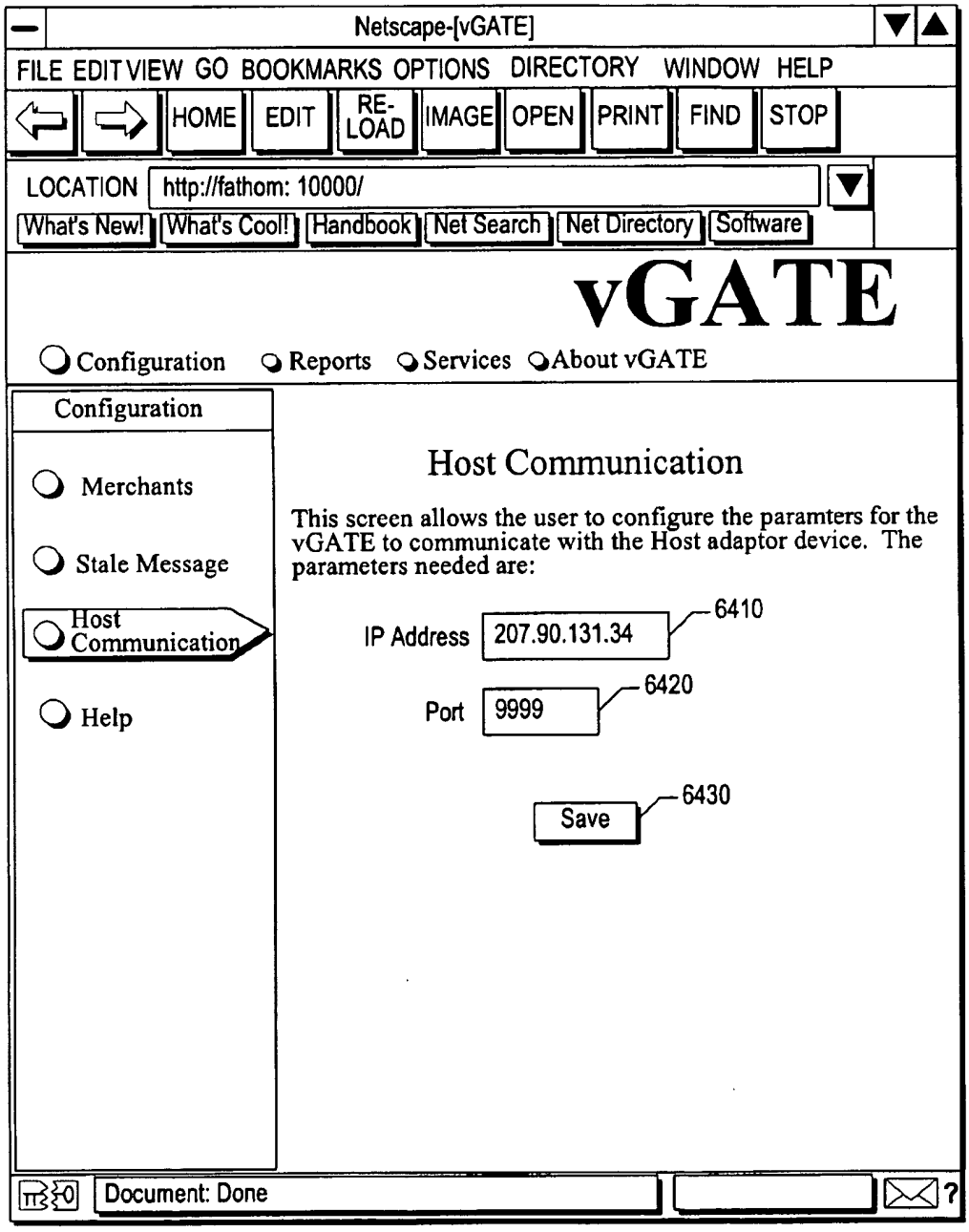

Netscape-[vGATE]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://fathom: 10000/
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
vGATE
Configuration
Reports
Services
About vGATE
Configuration
Merchants
Stale Message
Host Communication
Help
Host Communication
This screen allows the user to configure the paramters for the vGATE to communicate with the Host adaptor device. The parameters needed are:
IP Address
207.90.131.34
6410
Port
9999
6420
Save
6430
Document: Done

FIG. 64

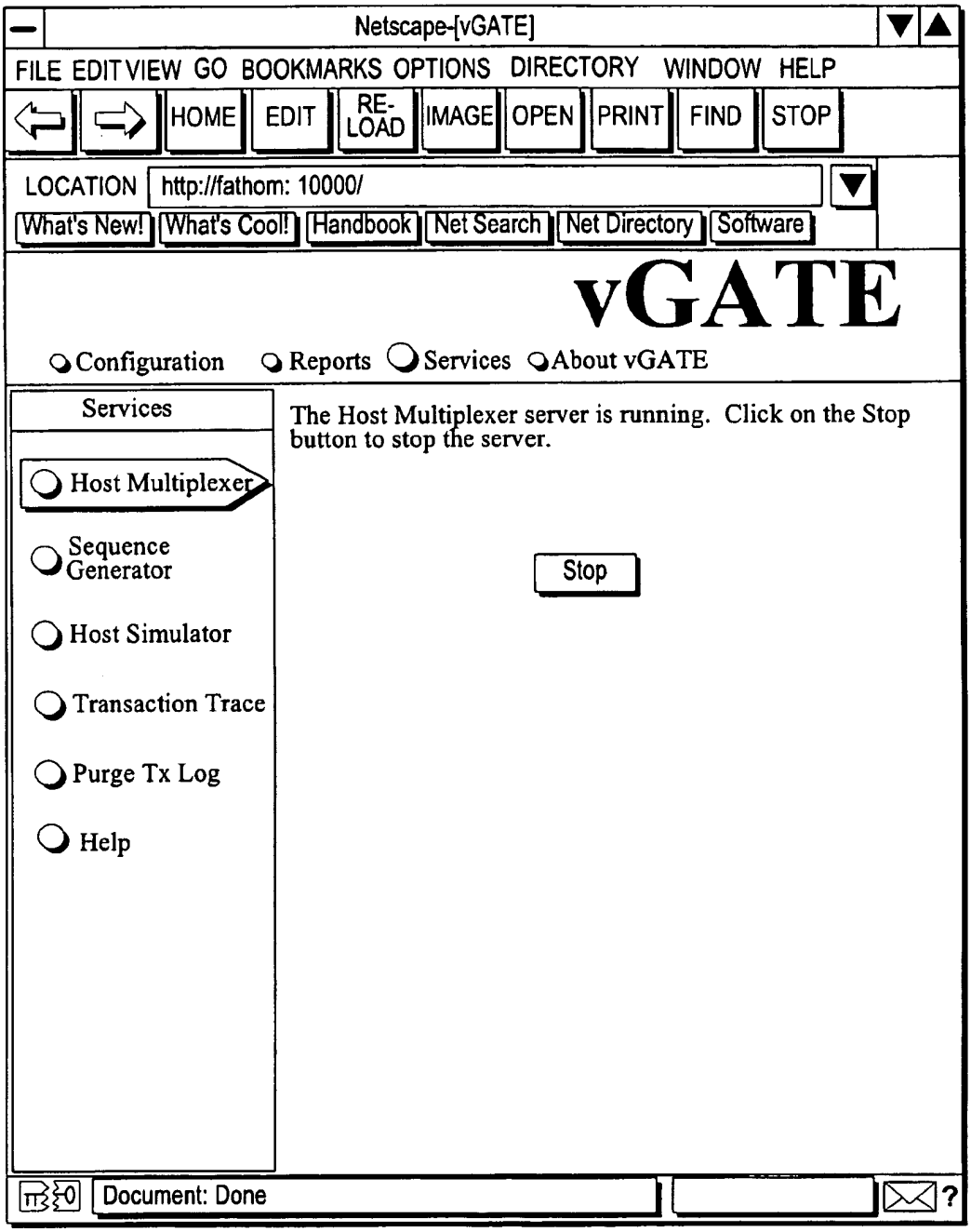

Netscape-[vGATE]
FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP
HOME
EDIT
RE-LOAD
IMAGE
OPEN
PRINT
FIND
STOP
LOCATION
http://fathom: 10000/
What's New!
What's Cool!
Handbook
Net Search
Net Directory
Software
vGATE
Configuration
Reports
Services
About vGATE
Services
Host Multiplexer
Sequence Generator
Host Simulator
Transaction Trace
Purge Tx Log
Help
The Host Multiplexer server is running. Click on the Stop button to stop the server.
Stop
Document: Done

FIG. 65

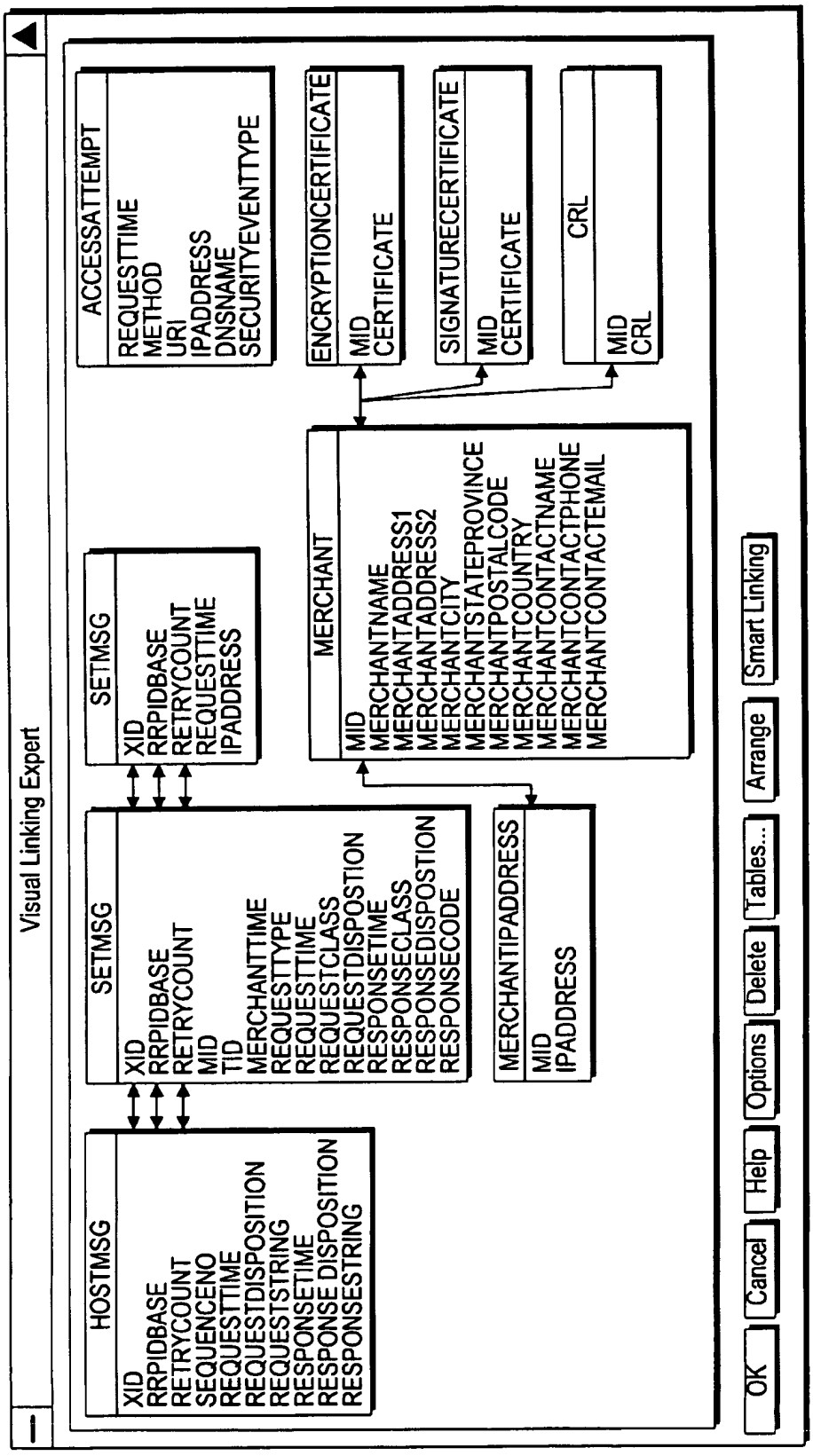

Visual Linking Expert
ACCESSATTEMPT
REQUESTTIME
METHOD
URI
IPADDRESS
DNSNAME
SECURITYEVENTTYPE
ENCRYPTIONCERTIFICATE
MID
CERTIFICATE
SIGNATURECERTIFICATE
MID
CERTIFICATE
CRL
MID
CRL
SETMSG
XID
RRPIDBASE
RETRYCOUNT
REQUESTTIME
IPADDRESS
MERCHANT
MID
MERCHANTNAME
MERCHANTADDRESS1
MERCHANTADDRESS2
MERCHANTCITY
MERCHANTSTATEPROVINCE
MERCHANTPOSTALCODE
MERCHANTCOUNTRY
MERCHANTCONTACTNAME
MERCHANTCONTACTPHONE
MERCHANTCONTACTEMAIL
SETMSG
XID
RRPIDBASE
RETRYCOUNT
MID
TID
MERCHANTTIME
REQUESTTYPE
REQUESTTIME
REQUESTCLASS
REQUESTDISPOSTION
RESPONSETIME
RESPONSECLASS
RESPONSEDISPOSTION
RESPONSECODE
MERCHANTIPADDRESS
MID
IPADDRESS
HOSTMSG
XID
RRPIDBASE
RETRYCOUNT
SEQUENCENO
REQUESTTIME
REQUESTDISPOSITION
REQUESTSTRING
RESPONSETIME
RESPONSE DISPOSITION
RESPONSESTRING
OK
Cancel
Help
Options
Delete
Tables...
Arrange
Smart Linking

FIG. 66

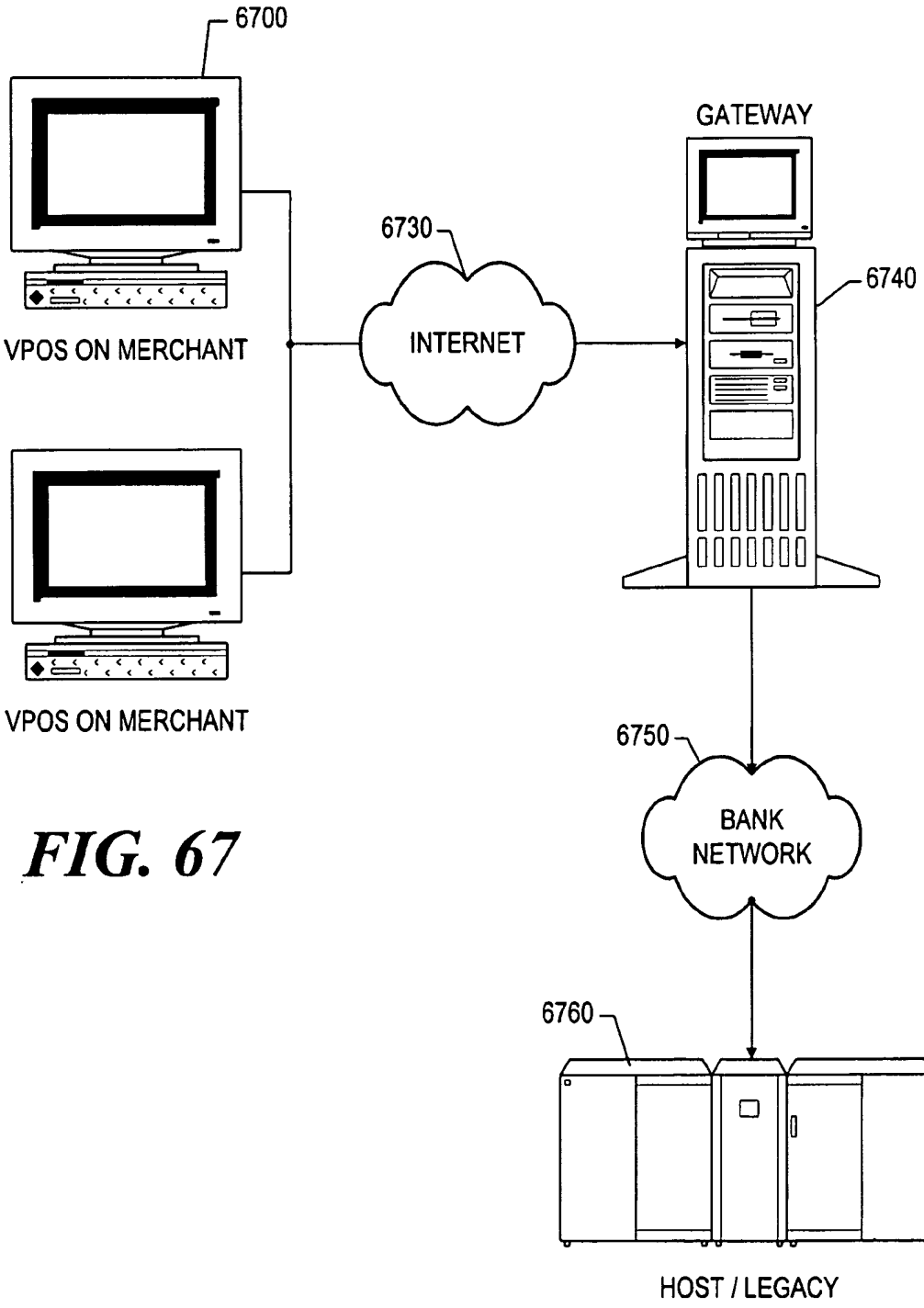

6700
GATEWAY
6730
6740
INTERNET
VPOS ON MERCHANT
VPOS ON MERCHANT
6750
BANK
NETWORK
6760
HOST / LEGACY

FIG. 67

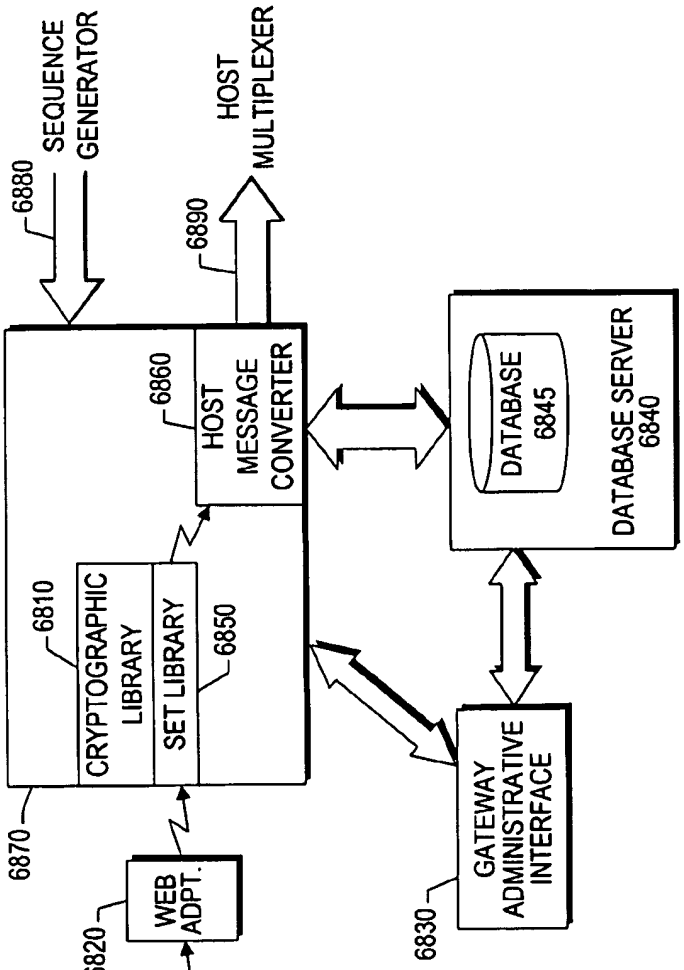

SEQUENCE GENERATOR
6880
HOST MULTIPLEXER
6890
HOST MESSAGE CONVERTER
6860
DATABASE
6845
DATABASE SERVER
6840
CRYPTOGRAPHIC LIBRARY
6810
SET LIBRARY
6850
6870
WEB ADPT.
6820
GATEWAY ADMINISTRATIVE INTERFACE
6830
HTTP SERVER
6800
FROM VPOS

FIG. 68

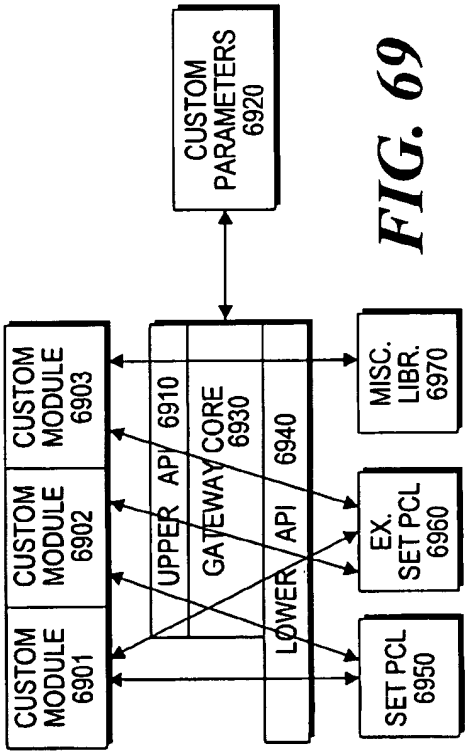

CUSTOM PARAMETERS
6920
CUSTOM MODULE
6903
CUSTOM MODULE
6902
CUSTOM MODULE
6901
UPPER API
6910
GATEWAY CORE
6930
LOWER API
6940
MISC. LIBR.
6970
EX. SET PCL
6960
SET PCL
6950

FIG. 69

SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR A PAYMENT GATEWAY SYSTEM ARCHITECTURE FOR PROCESSING ENCRYPTED PAYMENT TRANSACTIONS UTILIZING A MULTICHANNEL, EXTENSIBLE, FLEXIBLE ARCHITECTURE

FIELD OF THE INVENTION

The present invention relates to the secure, electronic payment in exchange for goods and services purchased over a communication network, and more specifically, to a system, method and article of manufacture for a payment gateway system architecture for processing encrypted payment transactions utilizing a multichannel, extensible, flexible architecture.

Today, approximately 350 billion coin and currency transactions occur between individuals and institutions every year. The extensive use of coin and currency transactions has limited the automation of individual transactions such as purchases, fares, and bank account deposits and withdrawals. Individual cash transactions are burdened by the need to have the correct amount of cash or providing change therefor. Furthermore, the handling and managing of paper cash and coins is inconvenient, costly and time consuming for both individuals and financial institutions.

Although checks may be written for any specific amount up to the amount available in the account, checks have very limited transferability and must be supplied from a physical inventory. Paper-based checking systems do not offer sufficient relief from the limitations of cash transactions, sharing many of the inconveniences of handling currency while adding the inherent delays associated with processing checks. To this end, economic exchange has striven for greater convenience at a lower cost, while also seeking improved security.

Automation has achieved some of these qualities for large transactions through computerized electronic funds transfer ("EFT") systems. Electronic funds transfer is essentially a process of value exchange achieved through the banking system's centralized computer transactions. EFT services are a transfer of payments utilizing electronic "checks," which are used primarily by large commercial organizations.

The Automated Clearing House ("ACH") where a user can enter a pre-authorized code and download information with billing occurring later, and a Point Of Sale (POS) system where a transaction is processed by connecting with a central computer for authorization for the transaction granted or denied immediately are examples of EFT systems that are utilized by retail and commercial organizations. However, the payments made through these types of EFT systems are limited in that they cannot be performed without the banking system. Moreover, ACH transactions usually cannot be performed during off business hours.

Home Banking bill payment services are examples of an EFT system used by individuals to make payments from a home computer. Currently, home banking initiatives have found few customers. Of the banks that have offered services for payments, account transfers and information over the telephone lines using personal computers, less than one percent of the bank's customers are using the service. One reason that Home Banking has not been a successful product is because the customer cannot deposit and withdraw money as needed in this type of system.

Current EFT systems, credit cards, or debit cards, which are used in conjunction with an on-line system to transfer money between accounts, such as between the account of a merchant and that of a customer, cannot satisfy the need for an automated transaction system providing an ergonomic interface. Examples of EFT systems which provide non-ergonomic interfaces are disclosed in U.S. Pat. Nos. 5,476,259; 5,459,304; 5,452,352; 5,448,045; 5,478,993; 5,455,407; 5,453,601; 5,465,291; and 5,485,510.

To implement an automated, convenient transaction that can dispense some form of economic value, there has been a trend towards off-line payments. For example, numerous ideas have been proposed for some form of "electronic money" that can be used in cashless payment transactions as alternatives to the traditional currency and check types of payment systems. See U.S. Pat. No. 4,977,595, entitled "METHOD AND APPARATUS FOR IMPLEMENTING ELECTRONIC CASH," and U.S. Pat. No. 4,305,059, entitled "MODULAR FUNDS TRANSFER SYSTEM."

The more well known techniques include magnetic stripe cards purchased for a given amount and from which a prepaid value can be deducted for specific purposes. Upon exhaustion of the economic value, the cards are thrown away. Other examples include memory cards or so called smart cards which are capable of repetitively storing information representing value that is likewise deducted for specific purposes.

It is desirable for a computer operated under the control of a merchant to obtain information offered by a customer and transmitted by a computer operating under the control of the customer over a publicly accessible packet-switched network (e.g., the Internet) to the computer operating under the control of the merchant, without risking the exposure of the information to interception by third parties that have access to the network, and to assure that the information is from an authentic source. It is further desirable for the merchant to transmit information, including a subset of the information provided by the customer, over such a network to a payment gateway computer system that is designated, by a bank or other financial institution that has the responsibility of providing payment on behalf of the customer, to authorize a commercial transaction on behalf of such a financial institution, without the risk of exposing that information to interception by third parties. Such institutions include, for example, financial institutions offering credit or debit card services.

One such attempt to provide such a secure transmission channel is a secure payment technology such as Secure Electronic Transaction (hereinafter "SET"), jointly developed by the Visa and MasterCard card associations, and described in Visa and MasterCard's *Secure Electronic Transaction (SET) Specification*, Feb. 23, 1996, hereby incorporated by reference. Other such secure payment technologies include Secure Transaction Technology ("STT"),

Secure Electronic Payments Protocol ("SEPP"), Internet Keyed Payments ("iKP"), Net Trust, and Cybercash Credit Payment Protocol. One of ordinary skill in the art readily comprehends that any of the secure payment technologies can be substituted for the SET protocol without undue experimentation. Such secure payment technologies require the customer to operate software that is compliant with the secure payment technology, interacting with third-party certification authorities, thereby allowing the customer to transmit encoded information to a merchant, some of which may be decoded by the merchant, and some which can be decoded only by a payment gateway specified by the customer.

Another such attempt to provide such a secure transmission channel is a general-purpose secure communication

protocol such as Netscape, Inc.'s Secure Sockets Layer (hereinafter "SSL") , as described in Freier, Karlton & Kocher (hereinafter "Freier"), *The SSL Protocol Version* 3.0, March 1996, and hereby incorporated by reference. SSL provides a means for secure transmission between two computers. SSL has the advantage that it does not require special-purpose software to be installed on the customer's computer because it is already incorporated into widely available software that many people utilize as their standard Internet access medium, and does not require that the customer interact with any third-party certification authority. Instead, the support for SSL may be incorporated into software already in use by the customer, e.g., the Netscape Navigator World Wide Web browsing tool. However, although a computer on an SSL connection may initiate a second SSL connection to another computer, a drawback to the SSL approach is each SSL connection supports only a two-computer connection. Therefore, SSL does not provide a mechanism for transmitting encoded information to a merchant for retransmission to a payment gateway such that a subset of the information is readable to the payment gateway but not to the merchant. Although SSL allows for robustly secure two-party data transmission, it does not meet the ultimate need of the electronic commerce market for robustly secure three-party data transmission. Other examples of general-purpose secure communication protocols include Private Communications Technology ("PCT") from Microsoft, Inc., Secure Hyper-Text Transport Protocol ("SHTTP") from Terisa Systems, Shen, Kerberos, Photuris, Pretty Good Privacy ("PGP") which meets the IPSEC criteria. One of ordinary skill in the art readily comprehends that any of the general-purpose secure communication protocols can be substituted for the SSL transmission protocol without undue experimentation.

Banks desire an Internet payment solution that emulates existing Point of Sale (POS) applications that are currently installed on their host computers, and require minimal changes to their host systems. This is a critical requirement since any downtime for a bank's host computer system represents an enormous expense. Currently, VeriFone supports over fourteen hundred different payment-related applications. The large number of applications is necessary to accommodate a wide variety of host message formats, diverse methods for communicating to a variety of hosts with different dial-up and direct-connect schemes, and different certification around the world. In addition, there are a wide variety of business processes that dictate how a Point of Sale (POS) terminal queries a user for data and subsequently displays the data. Also, various vertical market segments, such as hotels, car rental agencies, restaurants, retail sales, mail sales/telephone sales require interfaces for different types of data to be entered, and provide different discount rates to merchants for complying with various data types. Moreover, a plethora of report generation mechanisms and formats are utilized by merchants that banking organizations work with.

Banks are unwilling to converge on "standards" since convergence would facilitate switching from one acquiring bank to another by merchants. In general, banks desire to increase the cost that a merchant incurs in switching from one acquiring bank to another acquiring bank. This is accomplished by supplying a merchant with a terminal that only communicates utilizing the bank's proprietary protocol, and by providing other value-added services that a merchant may not be able to obtain at another bank.

Internet-based payment solutions require additional security measures that are not found in conventional POS terminals. This additional requirement is necessitated because Internet communication is done over publicly-accessible, unsecured communication line in stark contrast to the private, secure, dedicated phone or leased line service utilized between a traditional merchant and an acquiring bank. Thus, it is critical that any solution utilizing the Internet for a communication backbone, employ some form of cryptography.

As discussed above, the current state-of-the-art Internet based payment processing is a protocol referred to as SET. Since the SET messages are uniform across all implementations, banks cannot differentiate themselves in any reasonable way. Also, since SET is not a proper superset of all protocols utilized today, there are bank protocols which cannot be mapped or translated into SET because they require data elements for which SET has no placeholder. Further, SET only handles the message types directly related to authorizing and capturing credit card transactions and adjustments to these authorizations or captures. In a typical POS terminal in the physical world, these messages comprise almost the entire volume of the total number of messages between the merchant and the authorizing bank, but only half of the total number of different message types. These message types, which are used infrequently, but which are critical to the operation of the POS terminal must be supported for proper transaction processing.

SUMMARY OF THE INVENTION

According to a broad aspect of a preferred embodiment of the invention, a server communicates bidirectionally with a gateway over a first communication link, over which all service requests are initiated by the server. Secure transmission of data is provided from a customer computer system to a merchant computer system, and for the further secure transmission of payment information regarding a payment instrument from the merchant computer system to a payment gateway computer system. The payment gateway system receives encrypted payment requests from merchants, as HTTP POST messages via the Internet. The gateway then unwraps and decrypts the requests, authenticates digital signatures of the requests based on certificates, supports transaction types and card types as required by a financial institution, and accepts concurrent VPOS transactions from each of the merchant servers. Then, the gateway converts transaction data to host-specific formats and forwards the mapped requests to the host processor using the existing financial network. The gateway architecture includes three distinct sections to enhance distribution of the functions. The upper API consists of concise functions which are available via a call out interface to custom modules. The lower API allows the gateway and the custom modules to call in to reusable functions which facilitate isolation from possible future fluctuations in structural definitions of SET data elements. The system configuration custom parameters include the more static information elements required for such things as the network address of the host or its proxy equipment, timeout values, expected length of certain messages and other system configuration information. These parameters are specified as name-value pairs in the gateway system initialization file.

DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages are better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

FIG. 1A is a block diagram of a representative hardware environment in accordance with a preferred embodiment;

FIG. 1B depicts an overview in accordance with a preferred embodiment;

FIG. 1C is a block diagram of the system in accordance with a preferred embodiment;

FIG. 2 depicts a more detailed view of a customer computer system in communication with merchant system under the Secure Sockets Layer protocol in accordance with a preferred embodiment;

FIG. 3 depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization in accordance with a preferred embodiment;

FIG. 4 depicts the detailed steps of generating and transmitting a payment authorization request in accordance with a preferred embodiment;

FIGS. 5A through 5F depict views of the payment authorization request and its component parts in accordance with a preferred embodiment;

FIGS. 6A and 6B depict the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response in accordance with a preferred embodiment;

FIGS. 7A through 7J depict views of the payment authorization response and its component parts in accordance with a preferred embodiment;

FIG. 8 depicts the detailed steps of processing a payment authorization response in accordance with a preferred embodiment;

FIG. 9 depicts an overview of the method of securely supplying payment capture information to a payment gateway in accordance with a preferred embodiment;

FIG. 10 depicts the detailed steps of generating and transmitting a payment capture request in accordance with a preferred embodiment;

FIGS. 11A through 11F depict views of the payment capture request and its component parts in accordance with a preferred embodiment;

FIGS. 12A and 12B depict the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response in accordance with a preferred embodiment;

FIGS. 13A through 13F depict views of the payment capture response and its component parts in accordance with a preferred embodiment;

FIG. 14 depicts the detailed steps of processing a payment capture response in accordance with a preferred embodiment;

FIGS. 15A & 15B depicts transaction processing of merchant and consumer transactions in accordance with a preferred embodiment;

FIG. 16 illustrates a transaction class hierarchy block diagram in accordance with a preferred embodiment;

FIG. 17 shows a typical message flow between the merchant, VPOS terminal and the Gateway in accordance with a preferred embodiment;

FIGS. 18A–E are block diagrams of the extended SET architecture in accordance with a preferred embodiment;

FIG. 19 is a flowchart of VPOS merchant pay customization in accordance with a preferred embodiment;

FIGS. 20A–20H are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment;

FIG. 21 is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment;

FIG. 22 is a flow diagram in accordance with a preferred embodiment;

FIG. 23 illustrates a Gateway's role in a network in accordance with a preferred embodiment;

FIG. 24 is a block diagram of the Gateway in accordance with a preferred embodiment;

FIG. 25 is a block diagram of the VPOS Terminal Architecture in accordance with a preferred embodiment;

FIG. 26 is an architecture block diagram in accordance with a preferred embodiment;

FIG. 27 is a block diagram of the payment manager architecture in accordance with a preferred embodiment;

FIG. 28 is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention;

FIG. 29 is an illustration of a certificate issuance form in accordance with a preferred embodiment;

FIG. 30 illustrates a certificate issuance response in accordance with a preferred embodiment;

FIG. 31 illustrates a collection of payment instrument holders in accordance with a preferred embodiment;

FIG. 32 illustrates the default payment instrument bitmap in accordance with a preferred embodiment;

FIG. 33 illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment;

FIG. 34 illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention;

FIG. 35 is a flowchart of conditional authorization of payment in accordance with a preferred embodiment;

FIGS. 36–48 are screen displays in accordance with a preferred embodiment;

FIG. 49 shows how the VPOS authenticates an incoming response to a request in accordance with a preferred embodiment;

FIG. 50 is a flowchart for the merchant interaction with the Test Gateway in accordance with a preferred embodiment;

FIGS. 51, 52A–52B, 53–55, 56A –56B, and 57–61 are flowcharts depicting the detailed logic of the gateway in accordance with a preferred embodiment;

FIG. 62 is the main administration display for the Gateway in accordance with a preferred embodiment;

FIG. 63 is a configuration panel in accordance with a preferred embodiment;

FIG. 64 is a host communication display for facilitating communication between the gateway and the acquirer payment host in accordance with a preferred embodiment;

FIG. 65 is a Services display in accordance with a preferred embodiment;

FIG. 66 is a graphical representation of the gateway transaction database in accordance with a preferred embodiment;

FIG. 67 illustrates the gateway hardware architecture in accordance with a preferred embodiment;

FIG. 68 is a block diagram setting forth the gateway software architecture in accordance with a preferred embodiment; and

FIG. 69 is a block diagram setting forth the gateway components and interfaces in accordance with a preferred embodiment.

DETAILED DESCRIPTION

A preferred embodiment of a system in accordance with the present invention is preferably practiced in the context of a personal computer such as the IBM PS/2, Apple Macintosh computer or UNIX based workstation. A representative hardware environment is depicted in FIG. 1A, which illustrates a typical hardware configuration of a workstation in accordance with a preferred embodiment having a central processing unit **10**, such as a microprocessor, and a number of other units interconnected via a system bus **12**. The workstation shown in FIG. 1A includes a Random Access Memory (RAM) **14**, Read Only Memory (ROM) **16**, an I/O adapter **18** for connecting peripheral devices such as disk storage units **20** to the bus **12**, a user interface adapter **22** for connecting a keyboard **24**, a mouse **26**, a speaker **28**, a microphone **32**, and/or other user interface devices such as a touch screen (not shown) to the bus **12**, communication adapter **34** for connecting the workstation to a communication network (e.g., a data processing network) and a display adapter **36** for connecting the bus **12** to a display device **38**. The workstation typically has resident thereon an operating system such as the Microsoft Windows NT or Windows/95 Operating System (OS), the IBM OS/2 operating system, the MAC OS, or UNIX operating system. Those skilled in the art will appreciate that the present invention may also be implemented on platforms and operating systems other than those mentioned.

A preferred embodiment is written using JAVA, C, and the C++ language and utilizes object oriented programming methodology. Object oriented programming (OOP) has become increasingly used to develop complex applications. As OOP moves toward the mainstream of software design and development, various software solutions require adaptation to make use of the benefits of OOP. A need exists for these principles of OOP to be applied to a messaging interface of an electronic messaging system such that a set of OOP classes and objects for the messaging interface can be provided.

OOP is a process of developing computer software using objects, including the steps of analyzing the problem, designing the system, and constructing the program. An object is a software package that contains both data and a collection of related structures and procedures. Since it contains both data and a collection of structures and procedures, it can be visualized as a self-sufficient component that does not require other additional structures, procedures or data to perform its specific task. OOP, therefore, views a computer program as a collection of largely autonomous components, called objects, each of which is responsible for a specific task. This concept of packaging data, structures, and procedures together in one component or module is called encapsulation.

In general, OOP components are reusable software modules which present an interface that conforms to an object model and which are accessed at run-time through a component integration architecture. A component integration architecture is a set of architecture mechanisms which allow software modules in different process spaces to utilize each others capabilities or functions. This is generally done by assuming a common component object model on which to build the architecture.

It is worthwhile to differentiate between an object and a class of objects at this point. An object is a single instance of the class of objects, which is often just called a class. A class of objects can be viewed as a blueprint, from which many objects can be formed.

OOP allows the programmer to create an object that is a part of another object. For example, the object representing a piston engine is said to have a composition-relationship with the object representing a piston. In reality, a piston engine comprises a piston, valves and many other components; the fact that a piston is an element of a piston engine can be logically and semantically represented in OOP by two objects.

OOP also allows creation of an object that "depends from" another object. If there are two objects, one representing a piston engine and the other representing a piston engine wherein the piston is made of ceramic, then the relationship between the two objects is not that of composition. A ceramic piston engine does not make up a piston engine. Rather it is merely one kind of piston engine that has one more limitation than the piston engine; its piston is made of ceramic. In this case, the object representing the ceramic piston engine is called a derived object, and it inherits all of the aspects of the object representing the piston engine and adds further limitation or detail to it. The object representing the ceramic piston engine "depends from" the object representing the piston engine. The relationship between these objects is called inheritance.

When the object or class representing the ceramic piston engine inherits all of the aspects of the objects representing the piston engine, it inherits the thermal characteristics of a standard piston defined in the piston engine class. However, the ceramic piston engine object overrides these ceramic specific thermal characteristics, which are typically different from those associated with a metal piston. It skips over the original and uses new functions related to ceramic pistons. Different kinds of piston engines have different characteristics, but may have the same underlying functions associated with it (e.g., how many pistons in the engine, ignition sequences, lubrication, etc.). To access each of these functions in any piston engine object, a programmer would call the same functions with the same names, but each type of piston engine may have different/overriding implementations of functions behind the same name. This ability to hide different implementations of a function behind the same name is called polymorphism and it greatly simplifies communication among objects.

With the concepts of composition-relationship, encapsulation, inheritance and polymorphism, an object can represent just about anything in the real world. In fact, our logical perception of the reality is the only limit on determining the kinds of things that can become objects in object-oriented software. Some typical categories are as follows:

- Objects can represent physical objects, such as automobiles in a traffic-flow simulation, electrical components in a circuit-design program, countries in an economics model, or aircraft in an air-traffic-control system.
- Objects can represent elements of the computer-user environment such as windows, menus or graphics objects.
- An object can represent an inventory, such as a personnel file or a table of the latitudes and longitudes of cities.
- An object can represent user-defined data types such as time, angles, and complex numbers, or points on the plane.

With this enormous capability of an object to represent just about any logically separable matters, OOP allows the software developer to design and implement a computer program that is a model of some aspects of reality, whether that reality is a physical entity, a process, a system, or a

composition of matter. Since the object can represent anything, the software developer can create an object which can be used as a component in a larger software project in the future.

If 90% of a new OOP software program consists of proven, existing components made from preexisting reusable objects, then only the remaining 10% of the new software project has to be written and tested from scratch. Since 90% already came from an inventory of extensively tested reusable objects, the potential domain from which an error could originate is 10% of the program. As a result, OOP enables software developers to build objects out of other, previously built, objects.

This process closely resembles complex machinery being built out of assemblies and sub-assemblies. OOP technology, therefore, makes software engineering more like hardware engineering in that software is built from existing components, which are available to the developer as objects. All this adds up to an improved quality of the software as well as an increased speed of its development.

Programming languages are beginning to fully support the OOP principles, such as encapsulation, inheritance, polymorphism, and composition-relationship. With the advent of the C++ language, many commercial software developers have embraced OOP. C++ is an OOP language that offers a fast, machine-executable code. Furthermore, C++ is suitable for both commercial-application and systems-programming projects. For now, C++ appears to be the most popular choice among many OOP programmers, but there is a host of other OOP languages, such as Smalltalk, common lisp object system (CLOS), and Eiffel. Additionally, OOP capabilities are being added to more traditional popular computer programming languages such as Pascal.

The benefits of object classes can be summarized, as follows:

- Objects and their corresponding classes break down complex programming problems into many smaller, simpler problems.
- Encapsulation enforces data abstraction through the organization of data into small, independent objects that can communicate with each other. Encapsulation protects the data in an object from accidental damage, but allows other objects to interact with that data by calling the object's member functions and structures.
- Subclassing and inheritance make it possible to extend and modify objects through deriving new kinds of objects from the standard classes available in the system. Thus, new capabilities are created without having to start from scratch.
- Polymorphism and multiple inheritance make it possible for different programmers to mix and match characteristics of many different classes and create specialized objects that can still work with related objects in predictable ways.
- Class hierarchies and containment hierarchies provide a flexible mechanism for modeling real-world objects and the relationships among them.
- Libraries of reusable classes are useful in many situations, but they also have some limitations. For example:
  - Complexity. In a complex system, the class hierarchies for related classes can become extremely confusing, with many dozens or even hundreds of classes.
  - Flow of control. A program written with the aid of class libraries is still responsible for the flow of control (i.e., it must control the interactions among all the objects created from a particular library). The programmer has to decide which functions to call at what times for which kinds of objects.
  - Duplication of effort. Although class libraries allow programmers to use and reuse many small pieces of code, each programmer puts those pieces together in a different way. Two different programmers can use the same set of class libraries to write two programs that do exactly the same thing but whose internal structure (i.e., design) may be quite different, depending on hundreds of small decisions each programmer makes along the way. Inevitably, similar pieces of code end up doing similar things in slightly different ways and do not work as well together as they should.

Class libraries are very flexible. As programs grow more complex, more programmers are forced to reinvent basic solutions to basic problems over and over again. A relatively new extension of the class library concept is to have a framework of class libraries. This framework is more complex and consists of significant collections of collaborating classes that capture both the small scale patterns and major mechanisms that implement the common requirements and design in a specific application domain. They were first developed to free application programmers from the chores involved in displaying menus, windows, dialog boxes, and other standard user interface elements for personal computers.

Frameworks also represent a change in the way programmers think about the interaction between the code they write and code written by others. In the early days of procedural programming, the programmer called libraries provided by the operating system to perform certain tasks, but basically the program executed down the page from start to finish, and the programmer was solely responsible for the flow of control. This was appropriate for printing out paychecks, calculating a mathematical table, or solving other problems with a program that executed in just one way.

The development of graphical user interfaces began to turn this procedural programming arrangement inside out. These interfaces allow the user, rather than program logic, to drive the program and decide when certain actions should be performed. Today, most personal computer software accomplishes this by means of an event loop which monitors the mouse, keyboard, and other sources of external events and calls the appropriate parts of the programmer's code according to actions that the user performs. The programmer no longer determines the order in which events occur. Instead, a program is divided into separate pieces that are called at unpredictable times and in an unpredictable order. By relinquishing control in this way to users, the developer creates a program that is much easier to use. Nevertheless, individual pieces of the program written by the developer still call libraries provided by the operating system to accomplish certain tasks, and the programmer must still determine the flow of control within each piece after it's called by the event loop. Application code still "sits on top of" the system.

Even event loop programs require programmers to write a lot of code that should not need to be written separately for every application. The concept of an application framework carries the event loop concept further. Instead of dealing with all the nuts and bolts of constructing basic menus, windows, and dialog boxes and then making these things all work together, programmers using application frameworks start with working application code and basic user interface elements in place. Subsequently, they build from there by replacing some of the generic capabilities of the framework with the specific capabilities of the intended application.

Application frameworks reduce the total amount of code that a programmer has to write from scratch. However, because the framework is really a generic application that displays windows, supports copy and paste, and so on, the programmer can also relinquish control to a greater degree than event loop programs permit. The framework code takes care of almost all event handling and flow of control, and the programmer's code is called only when the framework needs it (e.g., to create or manipulate a proprietary data structure).

A programmer writing a framework program not only relinquishes control to the user (as is also true for event loop programs), but also relinquishes the detailed flow of control within the program to the framework. This approach allows the creation of more complex systems that work together in interesting ways, as opposed to isolated programs, having custom code, being created over and over again for similar problems.

Thus, as is explained above, a framework basically is a collection of cooperating classes that make up a reusable design solution for a given problem domain. It typically includes objects that provide default behavior (e.g., for menus and windows), and programmers use it by inheriting some of that default behavior and overriding other behavior so that the framework calls application code at the appropriate times.

There are three main differences between frameworks and class libraries:

Behavior versus protocol. Class libraries are essentially collections of behaviors that you can call when you want those individual behaviors in your program. A framework, on the other hand, provides not only behavior but also the protocol or set of rules that govern the ways in which behaviors can be combined, including rules for what a programmer is supposed to provide versus what the framework provides.

Call versus override. With a class library, the code the programmer instantiates objects and calls their member functions. It's possible to instantiate and call objects in the same way with a framework (i.e., to treat the framework as a class library), but to take full advantage of a framework's reusable design, a programmer typically writes code that overrides and is called by the framework. The framework manages the flow of control among its objects. Writing a program involves dividing responsibilities among the various pieces of software that are called by the framework rather than specifying how the different pieces should work together.

Implementation versus design. With class libraries, programmers reuse only implementations, whereas with frameworks, they reuse design. A framework embodies the way a family of related programs or pieces of software work. It represents a generic design solution that can be adapted to a variety of specific problems in a given domain. For example, a single framework can embody the way a user interface works, even though two different user interfaces created with the same framework might solve quite different interface problems.

Thus, through the development of frameworks for solutions to various problems and programming tasks, significant reductions in the design and development effort for software can be achieved. A preferred embodiment of the invention utilizes HyperText Markup Language (HTML) to implement documents on the Internet together with a general-purpose secure communication protocol for a transport medium between the client and the merchant. HTTP or other protocols could be readily substituted for HTML without undue experimentation. Information on these products is available in T. Berners-Lee, D. Connoly, "RFC 1866: Hypertext Markup Language- 2.0" (November 1995); and R. Fielding, H, Frystyk, T. Berners-Lee, J. Gettys and J. C. Mogul, "Hypertext Transfer Protocol—HTTP/1.1: HTTP Working Group Internet Draft" (May 2, 1996). HTML is a simple data format used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of domains. HTML has been in use by the World-Wide Web global information initiative since 1990. HTML is an application of ISO Standard 8879:1986 Information Processing Text and Office Systems; Standard Generalized Markup Language (SGML).

To date, Web development tools have been limited in their ability to create dynamic Web applications which span from client to server and interoperate with existing computing resources. Until recently, HTML has been the dominant technology used in development of Web-based solutions. However, HTML has proven to be inadequate in the following areas:

Poor performance;

Restricted user interface capabilities;

Can only produce static Web pages;

Lack of interoperability with existing applications and data; and

Inability to scale.

Sun Microsystem's Java language solves many of the client-side problems by:

Improving performance on the client side;

Enabling the creation of dynamic, real-time Web applications; and

Providing the ability to create a wide variety of user interface components.

With Java, developers can create robust User Interface (UI) components. Custom "widgets" (e.g. real-time stock tickers, animated icons, etc.) can be created, and client-side performance is improved. Unlike HTML, Java supports the notion of client-side validation, offloading appropriate processing onto the client for improved performance. Dynamic, real-time Web pages can be created. Using the above-mentioned custom UI components, dynamic Web pages can also be created.

Sun's Java language has emerged as an industry-recognized language for "programming the Internet." Sun defines Java as: "a simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded, dynamic, buzzword-compliant, general-purpose programming language. Java supports programming for the Internet in the form of platform-independent Java applets." Java applets are small, specialized applications that comply with Sun's Java Application Programming Interface (API) allowing developers to add "interactive content" to Web documents (e.g. simple animations, page adornments, basic games, etc.). Applets execute within a Java-compatible browser (e.g. Netscape Navigator) by copying code from the server to client. From a language standpoint, Java's core feature set is based on C++. Sun's Java literature states that Java is basically "C++, with extensions from Objective C for more dynamic method resolution".

Another technology that provides similar function to JAVA is provided by Microsoft and ActiveX Technologies,

to give developers and Web designers wherewithal to build dynamic content for the Internet and personal computers. ActiveX includes tools for developing animation, 3-D virtual reality, video and other multimedia content. The tools use Internet standards, work on multiple platforms, and are being supported by over 100 companies. The group's building blocks are called ActiveX Controls, small, fast components that enable developers to embed parts of software in hypertext markup language (HTML) pages. ActiveX Controls work with a variety of programming languages including Microsoft Visual C++, Borland Delphi, Microsoft Visual Basic programming system and, in the future, Microsoft's development tool for Java, code named "Jakarta." ActiveX Technologies also includes ActiveX Server Framework, allowing developers to create server applications. One of ordinary skill in the art readily recognizes that ActiveX could be substituted for JAVA without undue experimentation to practice the invention.

FIG. **1B** depicts an overview of the present invention. Customer computer system **120** is in communication with merchant computer system **130**. The customer-merchant session **150** operates under a general-purpose secure communication protocol such as the SSL protocol. Merchant computer system **130** is additionally in communication with payment gateway computer system **140**. A payment gateway is a system that provides electronic commerce services in support of a bank or other financial institution, and that interfaces to the financial institution to support the authorization and capture of transactions. The customer-institution session **170** operates under a variant of a secure payment technology such as the SET protocol, as described herein, referred to as Merchant-Originated Secure Electronic Transactions ("MOSET"), as is more fully described herein.

Customer-to-Merchant Communication

FIG. **2** depicts a more detailed view of customer computer system **120** in communication with merchant system **130** using customer-merchant session **150** operating under the SSL protocol as documented in Freier and incorporated by reference.

Customer computer system **120** initiates communication with merchant computer system **130** using any well-known access protocol, e.g., Transmission Control Protocol/Internet Protocol ("TCP/IP"). A description of TCP/IP is provided in Information Sciences Institute, "Transmission Control Protocol DARPA Internet Program Protocol Specification (RFC 793)" (September, 1981), and Information Sciences Institute, "Internet Protocol DARPA Internet Program Protocol Specification (RFC 791)" (September, 1981). In this implementation, customer computer system **120** acts as a client and merchant computer system **130** acts as a server.

Customer computer system **120** initiates communication by sending "client hello" message **210** to the merchant computer system **130**. When a client first connects to a server it is required to send the client hello message **210** as its first message. The client can also send a client hello message **210** in response to a hello request on its own initiative in order to renegotiate the security parameters in an existing connection. The client hello message includes a random structure, which is used later in the protocol. Specifically, the random structure includes the current time and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. The client hello message **210** further includes a variable length session identifier. If not empty, the session identifier value identifies a session between the same client and server whose security parameters the client wishes to reuse. The session identifier may be from an earlier connection, the current connection, or another currently active connection. It is useful to specify the current connection if the client only wishes to update the random structures and derived values of a connection. It is useful to specify another currently active connection if the client wishes to establish several simultaneous independent secure connections to the same server without repeating the full handshake protocol. Client hello message **210** further includes an indicator of the cryptographic algorithms supported by the client in order of the client's preference, ordered according to client preference.

In response to client hello message **210**, if merchant computer system **130** wishes to correspond with customer computer system **120**, it responds with server hello message **215**. If merchant computer system **130** does not wish to communicate with customer computer system **120**, it responds with a message, not shown, indicating refusal to communicate.

Server hello message **215** includes a random structure, which is used later in the protocol. The random structure in server hello message **215** is in the same format as, but has contents independent of, the random structure in client hello message **210**. Specifically, the random structure includes the current time and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. Server hello message **215** further includes a variable length session identifier. The session identifier value identifies a new or existing session between the same client and server. Server hello message **215** further includes an indicator of the cryptographic algorithms selected from among the algorithms specified by client hello message **210**, which is utilized in further encrypted communications.

Optionally, Merchant computer system **130** transmits a server certificate **220**. If transmitted, server certificate **220** enables customer computer system **120** to authenticate the identity of merchant computer system **130**.

If merchant computer system **130** does not transmit a server certificate **220**, or if server certificate **220** is suitable only for authentication, it may optionally transmit a server key exchange message **225**. Server key exchange message **225** identifies a key that may be used by customer computer system **120** to decrypt further messages sent by merchant computer system **130**.

After transmitting server hello message **215**, and optionally transmitting server certificate **220** or server key exchange message **225**, merchant computer system **130** transmits a server hello done message **230** and waits for a further response from customer computer system **120**.

Customer computer system **120** optionally transmits client certificate **240** to merchant computer system **130**. If transmitted, client certificate **240** enables merchant computer system **130** to authenticate the identity of customer computer system **120**. Alternatively, customer computer system **120** may transmit a no-client-certificate alert **245**, to indicate that the customer has not registered with any certification authority.

If customer computer system **120** does not transmit a client certificate **240**, or if client certificate **240** is suitable only for authentication, customer computer system **130** may optionally transmit a client key exchange message **250**. Client key exchange message **250** identifies a key that may be used by merchant computer system **120** to decrypt further messages sent by customer computer system **120**.

After optionally transmitting client certificate **240**, no-client-certificate alert **245**, and/or client key exchange

message **250**, customer computer system **120** transmits a finished message **260**.

At this point, customer computer system **120** and merchant computer system **130** have:

1) negotiated an encryption scheme that may be commonly employed in further communications, and

2) have communicated to each other a set of encryption keys that may be used to decrypt further communications between the two computer systems.

Customer computer system **120** and merchant computer system **130** may thereafter engage in secure communications **270** with less risk of interception by third parties.

Among the messages communicated by customer computer system **120** to merchant computer system **130** may be messages that specify goods or services to be ordered and payment information, such as a credit card number and related information, collectively referred to as "payment information," that may be used to pay for the goods and/or services ordered. In order to obtain payment, the merchant must supply this information to the bank or other payment gateway responsible for the preferred payment method. This enables the merchant to perform payment authorization and payment capture. Payment authorization is the process by which permission is granted by a payment gateway operating on behalf of a financial institution to authorize payment on behalf of the financial institution. This is a process that assesses transaction risk, confirms that a given transaction does not raise the account holder's debt above the account's credit limit, and reserves the specified amount of credit. Payment capture is the process that triggers the movement of funds from the financial institution to the merchant's account after settlement of the account.

Payment Authorization

Merchants utilize point-of-sale products for credit and debit transactions on a daily basis. An embodiment in accordance with the subject invention allows an acquirer processor to accept transactions from Internet storefronts without altering a current host environment. The system easily converts payment protocol messages and simultaneously manages transactions from a number of Internet merchant servers. As the number of transactions grows, the payment gateway can be scaled to handle the increased business, and it can be configured to work with specific business processes used by the acquirer/processor. Thus, the payment gateway supports Internet processing utilizing payment processing operations.

The payment gateway provides support for configuring and installing the Internet payment capability utilizing existing host point-of-sale technology. The payment gateway also provides an intuitive Graphical User Interface (GUI) with support built in to accommodate future payment instruments such as debit cards, electronic checks, electronic cash and micropayments. The payment gateway implements secure transactions using RSA public-key cryptography and the MasterCard/Visa Secure Electronic Transaction (SET) protocol. The gateway also provides full functionality for merchant payment processing including authorization, capture, settlement and reconciliation while providing monitor activity with reporting and tracking of transactions sent over the Internet. Finally, the payment gateway also implements Internet payment procedures that match current processor business models to ensure consistency for merchants. Handling Internet transactions is destined to become a necessary function for every payment processing system. Today, merchants often transmit data received over the Internet inefficiently. Some fax the information or waste time keying data into a non-Internet system.

FIG. **3** depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization. In function block **310**, merchant computer system **130** generates a payment authorization request **315** and transmits it to payment gateway computer system **140**. In function block **330**, payment gateway system **140** processes the payment authorization request, generates a payment authorization response **325** and transmits it to merchant computer system **130**. In function block **320**, merchant computer system **130** processes payment authorization response **325** and determines whether payment for the goods or services sought to be obtained by the customer has been authorized.

Payment Authorization Request Generation

FIG. **4** depicts the detailed steps of generating and transmitting a payment authorization request. FIGS. **5A** through **5F** depict views of the payment authorization request and its component parts. In function block **410**, merchant computer system **130** creates a basic authorization request **510**. The basic authorization request is a data area that includes all the information for determining whether a request should be granted or denied. Specifically, it includes such information as the party who is being charged, the amount to be charged, the account number of the account to be charged, and any additional data, such as passwords, needed to validate the charge. This information is either calculated based upon prior customer merchandise selection, or provided by the customer over the secure link **270** established in the customer-merchant general-purpose secure communication protocol session. FIG. **5A** depicts a basic authorization request **510**.

In function block **420**, merchant computer system **130** combines basic authorization request **510**, a copy of its encryption public key certificate **515** and a copy of its signature public key certificate **520**. Merchant computer system **130** calculates a digital signature **525** for the combined contents of the combined block **530** comprising basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**, and appends it to the combination of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. The merchant computer system calculates digital signature **525** by first calculating a "message digest" based upon the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. A message digest is the fixed-length result that is generated when a variable length message is fed into a one-way hashing function. Message digests help verify that a message has not been altered because altering the message would change the digest. The message digest is then encrypted using the merchant computer system's **130** digital signature private key, thus forming a digital signature.

FIG. **5B** depicts the combined block **530** formed by function block **420** and containing basic authorization request **510**, the encryption public key certificate **515**, the signature public key certificate **520**, and digital signature **525**.

In function block **430**, merchant computer system **130** generates a random encryption key RK-0 **540**, denoted as RK-0. Random encryption key RK-0 **540** is a symmetric encryption key. A symmetric encryption key is a key char-

acterized by the property that a message encrypted with a symmetric key can be decrypted with that same key. This is contrasted with an asymmetric key pair, such as a public-key/private-key key pair, where a message encrypted with one key of the key pair may only be decrypted with the other key of the same key pair. FIG. 5C depicts random encryption key RK-0 **540**.

In function block **440**, merchant computer system **130** encrypts combined block **530** using random encryption key RK-0 **540** to form encrypted combined block **550**. FIG. SD depicts encrypted combined block **550**. The encryption state of encrypted combined block **550** is graphically shown by random key lock **555**, which indicates that encrypted combined block **550** is encrypted using random key RK-0 **540**.

In function block **450**, merchant computer system **130** encrypts random encryption key RK-0 **540** using the public key of payment gateway system **140** to form encrypted random key **560**. FIG. SE depicts encrypted random key **560**. The encryption state of encrypted random key **560** is graphically shown by payment gateway public key lock **565**, which indicates that encrypted random key **560** is encrypted using the payment gateway public key.

In function block **460**, merchant computer system **130** concatenates encrypted combined block **550** and encrypted random key **560** to form payment authorization request **315**. FIG. 5F depicts payment authorization request **315** comprising encrypted combined block **550** and encrypted random key **560**. In function block **470**, merchant computer system **130** transmits payment authorization request **315** to payment gateway system **140**.

Payment Authorization Request Processing

FIG. **6** depicts the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response. Function blocks **610** through **630** depict the steps of processing a payment authorization request, while function blocks **635** through **685** depict the steps of generating and transmitting a payment authorization request response.

In function block **610**, payment gateway computer system **140** applies its private key to encrypted random key **560** contained within received payment authorization request **315**, thereby decrypting it and obtaining a cleartext version of random key RK-0 **540**. In function block **615**, payment gateway computer system **140** applies random key RK-0 **540** to encrypted combined block **550**, thereby decrypting it and obtaining a cleartext version of combined block **530**. Combined block **530** comprises basic authorization request **510**, a copy of merchant computer system's **130** encryption public key certificate **515** and a copy of merchant computer system's **130** signature public key certificate **520**, as well as merchant digital signature **525**.

In function block **620**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **515** and merchant computer system's **130** signature public key certificate **520**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the authorization request.

In function block **625**, payment gateway computer system **140** validates merchant digital signature **525**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. Payment gateway computer system **140** then decrypts digital signature **525** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **420**. If the two message digests are equal, the digital signature **525** is validated. If validation fails, payment gateway computer system **140** rejects the authorization request.

In function block **630**, payment gateway computer system **140** determines the financial institution for which authorization is required by inspection of basic authorization request **510**.

Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, obtains a response indicating whether the requested payment is authorized.

Payment Authorization Response Generation

Function blocks **635** through **685** depict the steps of generating and transmitting a payment authorization request response. FIGS. **7**A through **7**J depict views of the payment authorization response and its component parts.

In function block **635**, payment gateway computer system **140** creates a basic authorization response **710**. The basic authorization request is a data area that includes all the information to determine whether a request was granted or denied. FIG. **7**A depicts basic authorization response **710**.

In function block **640**, payment gateway computer system **140** combines basic authorization response **710**, and a copy of its signature public key certificate **720**. Payment computer system **140** calculates a digital signature **725** for the combined contents of the combined block **730** comprising basic authorization response **710** and the signature public key certificate **720**, and appends the signature to the combination of the combined basic authorization response **710** and the signature public key certificate **720**. The payment gateway computer system calculates digital signature **725** by first calculating a message digest based on the contents of the combined basic authorization response **710** and signature public key certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a digital signature.

FIG. **7**B depicts the combined block **730** formed in function block **640** and containing basic authorization response **710**, the signature public key certificate **720**, and digital signature **725**.

In function block **645**, payment gateway computer system **150** generates a first symmetric random encryption key **740**, denoted as RK-1. FIG. **7**C depicts first random encryption key RK-1 **740**.

In function block **650**, payment gateway computer system **140** encrypts combined block **730** using random encryption key RK-1 **740** to form encrypted combined block **750**. FIG. **7**D depicts encrypted combined block **750**. The encryption state of encrypted combined block **750** is graphically shown by random key lock **755**, which indicates that encrypted combined block **750** is encrypted using random key RK-1 **740**.

In function block **655**, payment gateway computer system **140** encrypts random encryption key RK-1 **740** using the public key of merchant computer system **130** to form encrypted random key RK **760**. FIG. **7**E depicts encrypted random key RK-1 **760**. The encryption state of encrypted

random key **760** is graphically shown by merchant public key lock **765**, which indicates that encrypted random key **760** is encrypted using the merchant public key.

In function block **660**, payment gateway computer system **140** generates a random capture token **770**. Random capture token **770** is utilized in subsequent payment capture processing to associate the payment capture request with the payment authorization request being processed. FIG. **7F** depicts capture token **775**.

In function block **665**, payment gateway computer system **140** generates a second symmetric random encryption key **775**, denoted as RK-2. FIG. **7G** depicts second random encryption key RK-2 **775**.

In function block **670**, payment gateway computer system **140** encrypts capture token **770** using random encryption key RK-2 **770** to form encrypted capture token **780**. FIG. **7H** depicts encrypted capture token **780**. The encryption state of encrypted capture token **780** is graphically shown by random key lock **785**, which indicates that encrypted capture token **780** is encrypted using random key RK-2 **770**.

In function block **675**, payment gateway computer system **140** encrypts second random encryption key RK-2 **775** using its own public key to form encrypted random key RK-2 **790**. FIG. **71** depicts encrypted random key RK-2 **790**. The encryption state of encrypted random key **790** is graphically shown by payment gateway public key lock **795**, which indicates that encrypted random key **790** is encrypted using the payment gateway public key.

In function block **680**, payment gateway computer system **140** concatenates encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790** to form payment authorization response **325**. FIG. **7J** depicts payment authorization response **325** comprising encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790**. In function block **685**, payment gateway computer system **140** transmits merchant authorization response **325** to payment system **130**.

Payment Authorization Response Processing

FIG. **8** depicts the detailed steps of processing a payment authorization response. In function block **810**, payment computer system **130** applies its private key to encrypted random key RK-1 **760** contained within received merchant authorization response **325**, thereby decrypting it and obtaining a cleartext version of random key RK-1 **740**. In function block **820**, merchant computer system **130** applies random key RK-1 **740** to encrypted combined block **750**, thereby decrypting it and obtaining a cleartext version of combined block **730**. Combined block **730** comprises basic authorization response **710**, a copy of payment gateway computer system's **140** signature public key certificate **720**, as well as payment gateway digital signature **725**. In function block **830**, merchant computer system **130** verifies payment gateway computer system's **140** signature public key certificate **720**. Merchant computer system **130** performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system **130** concludes that the authorization response is counterfeit and treats it though the authorization request had been rejected.

In function block **840**, merchant computer system **130** validates payment gateway digital signature **725**. Merchant computer system **130** performs this validation by calculating a message digest over the contents of the combined basic authorization response **710** and the signature public key certificate **720**. Merchant computer system **130** then decrypts digital signature **725** to obtain a copy of the equivalent message digest calculated by payment gateway computer system **140** in function block **640**. If the two message digests are equal, the digital signature **725** is validated. If validation fails, concludes that the authorization response **710** is counterfeit and treats it though the authorization request had been rejected.

In function block **850**, merchant computer system **130** stores encrypted capture token **780** and encrypted random key RK-2 **790** for later use in payment capture. In function block **860**, merchant computer system **130** processes the customer purchase request in accordance with the authorization response **710**. If the authorization response **710** indicates that payment in authorized, merchant computer system **130** fills the requested order. If the authorization response **710** indicates that payment is not authorized, or if merchant computer system **130** determined in function block **830** or **840** that the authorization response **710** is counterfeit, merchant computer system **130** indicates to the customer that the order cannot be filled.

Payment Capture

FIG. **9** depicts an overview of the method of securely supplying payment capture information to payment gateway **140** in order to obtain payment capture. In function block **910**, merchant computer system **130** generates a merchant payment capture request **915** and transmits it to payment gateway computer system **140**. In function block **930**, payment gateway system **140** processes the payment capture request **915**, generates a payment capture response **925** and transmits it to merchant computer system **130**. In function block **920**, merchant computer system **130** processes payment capture response **925** and verifies that payment for the goods or services sought to be obtained by the customer have been captured.

Payment Capture Request Generation

FIG. **10** depicts the detailed steps of generating and transmitting a payment capture request. FIGS. **11A** through **11F** depict views of the payment capture request and its component parts. In function block **1010**, merchant computer system **130** creates a basic capture request **510**. The basic capture request is a data area that includes all the information needed by payment gateway computer system **140** to trigger a transfer of funds to the merchant operating merchant computer system **130**.

Specifically, a capture request includes a capture request amount, a capture token, a date, summary information of the purchased items and a Merchant ID (MID) for the particular merchant. FIG. **11A** depicts basic capture request **1110**.

In function block **1020**, merchant computer system **130** combines basic capture request **1110**, a copy of its encryption public key certificate **1115** and a copy of its signature public key certificate **1120**. Merchant computer system **130** calculates a digital signature **1125** for the combined contents of the combined block **1130** comprising basic capture request **1110**, the encryption public key certificate **1115** and the signature public key certificate **1120**, and appends it to the combination of the combined basic capture request **1110**, the encryption public key certificate **1115** and the signature public key certificate **1120**. The merchant computer system calculates digital signature **1125** by first calculating a message digest over the contents of the combined basic capture request **1110**, the encryption public key certificate **1115** and the signature public key certificate **1120**. The message digest

is then encrypted using the merchant computer system's **130** digital signature private key, thus forming a digital signature.

FIG. **11B** depicts the combined block **1130** formed by function block **1020** and containing basic capture request **1110**, the encryption public key certificate **1115**, the signature public key certificate **1120**, and digital signature **1125**. In function block **1030**, merchant computer system **130** generates a random encryption key **1140**, denoted as RK-3. Random encryption key RK-3 **1140** is a symmetric encryption key. FIG. **11C** depicts random encryption key RK-3 **1140**. In function block **1040**, merchant computer system **130** encrypts combined block **1130** using random encryption key RK-3 **1140** to form encrypted combined block **1150**. FIG. **11D** depicts encrypted combined block **1150**. The encryption state of encrypted combined block **1150** is graphically shown by random key lock **1155**, which indicates that encrypted combined block **1150** is encrypted using random key RK-3 **1140**. In function block **1050**, merchant computer system **130** encrypts random encryption key RK-3 **1140** using the public key of payment gateway system **140** to form encrypted random key **1160**. FIG. **11E** depicts encrypted random key **1160**. The encryption state of encrypted random key **1160** is graphically shown by payment gateway public key lock **1165**, which indicates that encrypted random key RK-3 **1160** is encrypted using the payment gateway public key.

In function block **1060**, merchant computer system **130** concatenates encrypted combined block **1150**, encrypted random key **1160**, and the encrypted capture token **780** and encrypted random key RK-2 **790** that were stored in function block **850** to form merchant capture request **915**. FIG. **11F** depicts merchant capture request **915**, comprising encrypted combined block **1150**, encrypted random key **1160**, encrypted capture token **780** and encrypted random key RK-2 **790**. In function block **1070**, merchant computer system **130** transmits merchant capture request **915** to payment gateway system **140**.

Payment Capture Request Processing

FIG. **12** depicts the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response. Function blocks **1210** through **1245** depict the steps of processing a payment capture request, while function blocks **1250** through **1285** depict the steps of generating and transmitting a payment capture request response. In function block **1210**, payment gateway computer system **140** applies its private key to encrypted random key **1160** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key RK-3 **1140**. In function block **1215**, payment gateway computer system **140** applies random key RK-3 **1140** to encrypted combined block **1150**, thereby decrypting it and obtaining a cleartext version of combined block **1130**. Combined block **1130** comprises basic capture request **1110**, a copy of merchant computer system's **130** encryption public key certificate **1115** and a copy of merchant computer system's **130** signature public key certificate **1120**, as well as merchant digital signature **1125**. In function block **1220**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **1115** and merchant computer system's **130** signature public key certificate **1120**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the capture request.

In function block **1225**, payment gateway computer system **140** validates merchant digital signature **1125**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic capture request **1110**, the encryption public key certificate **1115** and the signature public key certificate **1120**. Payment gateway computer system **140** then decrypts digital signature **1125** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **1020**. If the two message digests are equal, the digital signature **1125** is validated. If validation fails, payment gateway computer system **140** rejects the capture request. In function block **1230**, payment gateway computer system **140** applies its private key to encrypted random key RK-2 **790** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key RK-2 **775**. In function block **1235**, payment gateway computer system **140** applies random key RK-2 **775** to encrypted capture token **780**, thereby decrypting it and obtaining a cleartext version of capture token **770**.

In function block **1240**, payment gateway computer system **140** verifies that a proper transaction is being transmitted between capture token **780** and capture request **1110**. A capture token contains data that the gateway generates at the time of authorization. When the authorization is approved, the encrypted capture token is given to the merchant for storage. At the time of capture, the merchant returns the capture token to the gateway along with other information required for capture. Upon receipt of the capture token, the gateway compares a message made of the capture request data and the capture token data and transmits this information over a traditional credit/debit network. If an improperly formatted transaction is detected, payment gateway computer system **140** rejects the capture request. In function block **1245**, payment gateway computer system **140** determines the financial institution for which capture is requested by inspection of basic capture request **1110**. Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, instructs a computer at the financial institution to perform the requested funds transfer after settlement.

Payment Capture Response Generation

Function blocks **1250** through **1285** depict the steps of generating and transmitting a payment capture request response. FIGS. **13A** through **13F** depict views of the payment capture response and its component parts.

In function block **1250**, payment gateway computer system **140** creates a basic capture response **1310**. The basic capture request is a data area that includes all the information to indicate whether a capture request was granted or denied. FIG. **13A** depicts basic capture response **1310**.

In function block **1255**, payment gateway computer system **140** combines basic capture response **1310**, and a copy of its signature public key certificate **1320**. Payment computer system **140** calculates a digital signature **1325** for the combined contents of the combined block **1330** comprising basic capture response **1310** and the signature public key certificate **1320**, and appends the signature to the combination of the combined basic capture response **1310** and the signature public key certificate **1320**. The payment gateway computer system calculates digital signature **1325** by first calculating a message digest over the contents of the combined basic capture response **1310** and signature public key

certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a digital signature.

FIG. **13**B depicts the combined block **1330** formed by function block **1255** and containing basic capture response **1310**, the signature public key certificate **1320**, and digital signature **1325**. In function block **1260**, payment gateway computer system **140** generates a symmetric random encryption key **1340**, denoted as RK-4. FIG. **13**C depicts random encryption key RK-4 **1340**. In function block **1275**, payment gateway computer system **140** encrypts combined block **1330** using random encryption key RK-4 **1340** to form encrypted combined block **1350**. FIG. **13**D depicts encrypted combined block **1350**. The encryption state of encrypted combined block **1350** is graphically shown by random key lock **1355**, which indicates that encrypted combined block **1350** is encrypted using random key RK-4 **1340**. In function block **1275**, payment gateway computer system **140** encrypts random encryption key RK-4 **1340** using the public key of merchant computer system **130** to form encrypted random key RK-4 **1360**. FIG. **13**E depicts encrypted random key RK-4 **1360**. The encryption state of encrypted random key **1360** is graphically shown by merchant public key lock **1365**, which indicates that encrypted random key **1360** is encrypted using the merchant public key. In function block **1280**, payment gateway computer system **140** concatenates encrypted combined block **1350** and encrypted random key RK-4 **1360** to form merchant capture response **925**. FIG. **13**F depicts merchant capture response **925** comprising encrypted combined block **1350** and encrypted random key RK-4 **1360**. In function block **1285**, payment gateway computer system **140** transmits merchant capture response **925** to merchant system **130**.

Payment Capture Response Processing

FIG. **14** depicts the detailed steps of processing a payment capture response. In function block **1410**, merchant computer system **130** applies its private key to encrypted random key RK-4 **1360** contained within received merchant capture response **925**, thereby decrypting it and obtaining a cleartext version of random key RK-4 **1340**. In function block **1420**, merchant computer system **130** applies random key RK-4 **1340** to encrypted combined block **1350**, thereby decrypting it and obtaining a cleartext version of combined block **1330**. Combined block **1330** comprises basic capture response **1310**, a copy of payment gateway computer system's **140** signature public key certificate **1320**, as well as payment gateway digital signature **1325**. In function block **1430**, merchant computer system **130** verifies payment gateway computer system's **140** signature public key certificate **1320**. Merchant computer system **130** performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system **130** concludes that the capture response is counterfeit and raises an error condition.

In function block **1440**, merchant computer system **130** validates payment gateway digital signature **1325**. Merchant computer system **130** performs this validation by calculating a message digest over the contents of the combined basic capture response **1310** and the signature public key certificate **1320**. Merchant computer system **130** then decrypts digital signature **1325** to obtain a copy of the equivalent message digest calculated by payment gateway computer system **140** in function block **1255**. If the two message digests are equal, the digital signature **1325** is validated. If validation fails, merchant computer system **130** concludes that the authorization response is counterfeit and raises an error condition. In function block **1450**, merchant computer system **130** stores capture response for later use in by legacy system accounting programs, e.g. to perform reconciliation between the merchant operating merchant computer system **130** and the financial institution from whom payment was requested, thereby completing the transaction. The system of the present invention permits immediate deployment of a secure payment technology architecture such as the SET architecture without first establishing a public-key encryption infrastructure for use by consumers. It thereby permits immediate use of SET-compliant transaction processing without the need for consumers to migrate to SET-compliant application software.

VIRTUAL POINT OF SALE (VPOS) DETAILS

A Virtual Point of Sale (VPOS) Terminal Cartridge is described in accordance with a preferred embodiment. The VPOS Terminal Cartridge provides payment functionality similar to what a VeriFone PoS terminal ("gray box") provides for a merchant today, allowing a merchant to process payments securely using the Internet. It provides full payment functionality for a variety of payment instruments.

Payment Functionality

FIG. **15**A illustrates a payment processing flow in accordance with a preferred embodiment. The payment functionality provided by the VPOS terminal is divided into two main categories: "Merchant-Initiated" **1510** and "Consumer-Initiated" **1500**. Some payment transactions require communication with the acquirer bank through the Gateway **1530**. The normal flow of a transaction is via the VPOS Cartridge API **1512** to the VPOS C++ API **1514** into the payment protocol layer **1516** which is responsible for converting into the appropriate format for transmission to the Gateway for additional processing and forwarding to existing host payment authorization systems. Host legacy format refers to an existing authorization system for credit card approval currently utilized with the VeriFone Point of Sale (POS) gray terminals. The output from the payment protocol layer **1516** is transmitted to the authorization processing center via the gateway **1530**. These transactions are referred to as "Online Transactions" or "Host Payments." The transactions that can be done locally by the merchant without having to communicate with the acquirer bank are referred to as "Local Functions and Transactions." To support different types of payment instruments, the VPOS Terminal payment functionality is categorized as set forth below.

- Host Payment Functionality: These transactions require communication with the final host, either immediately or at a later stage. For example, an Online Authorization-Only transaction, when initiated, communicates with the host immediately. However, an Off-line Authorization-Only transaction is locally authorized by the VPOS terminal without having to communicate with the host, but at a later stage this off-line authorization transaction is sent to the host. Within the Host Payment Functionality some transactions have an associated Payment Instrument, while others do not. These two kinds of transactions are:
- Host Financial Payment Functionality: These transactions have a Payment Instrument (Credit Card, Debit Card, E-Cash, E-Check, etc.) associated with them. For example, the "Return" transaction, which is initiated upon returning a merchandise to the merchant.
- Host Administrative Payment Functionality: These transactions do not require a payment instrument, and pro-

vide either administrative or inquiry functionality. Examples of these transactions are "Reconcile" or the "Batch Close."

Local Functions and Transactions: These transactions do not require communication with the host at any stage, and provide essential VPOS terminal administrative functionality. An example of this is the VPOS terminal configuration function, which is required to set up the VPOS terminal. Another example is the "VPOS Batch Review" function, which is required to review the different transactions in the VPOS Batch or the Transaction Log.

Payment Instruments

A preferred embodiment of a VPOS terminal supports various Payment Instruments. A consumer chooses a payment based on personal preferences. Some of the Payment Instruments supported include:

Credit Cards

Debit Cards

Electronic Cash

Electronic Checks

Micro-Payments (electronic coin)

Smart Cards

LOCAL FUNCTIONS & TRANSACTIONS

accum review	/VPOSt/mi/accum/review/	not allowed	merchant login/password
batch review	/VPOSt/mi/batch/review/	not allowed	merchant login/password
cdt review	/VPOSt/mi/cdt/review/	not allowed	merchant login/password
cdt update	/VPOSt/mi/cdt/update/	allowed	merchant login/password
cpt review	/VPOSt/mi/cpt/review	not allowed	merchant login/password
cpt update	/VPOSt/mi/cpt/update/	allowed	merchant login/password
clear accum	/VPOSt/accum/clear/	allowed	merchant login/password
clear batch	/VPOSt/mi/batch/clear/	allowed	merchant login/password
hdt review	/VPOSt/mi/hdt/review/	not allowed	merchant login/password
hdt update	/VPOSt/mi/hdt/update/	allowed	merchant login/password
lock VPOS	/VPOSt/mi/lock/	allowed	merchant login/password
query txn	/VPOSt/ci/querytxn/	not allowed	no access control
query txn	/VPOSt/mi/querytxn/	not allowed	merchant login/password
tct review	/VPOSt/mi/tct/review/	not allowed	merchant login/password
tct update	/VPOSt/mi/tct/update/	allowed	merchant login/password
unlock VPOS	/VPOSt/mi/unlock/	allowed	merchant login/password

URL Descriptions

This section describes the GET and POST arguments that are associated with each transaction URL. It also describes the results from the GET and POST methods. For URLs that produce any kind of results, the following fields are present in the HTML document that is returned by the VPOS Terminal Cartridge:

txnDate	Date of the transaction (mm/dd/yy or dd/mm/yy)
txnTime	Time of the transaction (hh:mm:ss GMT or hh:mm:ss local time)
merchantId	Merchant ID of the merchant using the VPOS terminal
terminalId	VPOS Terminal Id
txnNum	Transaction number of the given transaction
txnType	Type of transaction

For URLs that deal with financial transactions, the following fields are present in the HTML document that is returned by the VPOS terminal cartridge:

txnAmount	Transaction amount that is being authorized, forced posted, voided, etc.
poNumber	Purchase order number
authIdentNum	Authorization ID number for the transaction
retRefNum	Retrieval reference number for the given transaction
piInfo	Payment instrument information. This varies for different payment instruments. For example, in the case of credit cards, the credit card number (piAcctNumber) and expiration date (piExpDate) are returned.

Accumulate Review

URL Functionality: This is a local information inquiry function that retrieves the local (merchant's) transaction totals (accumulators).

GET Arguments: None.

GET Results: Retrieves the transaction totals for the merchant. Currently, the total is returned as an HTML document. The transaction totals currently returned are:

creditAmt	Total Credit Amount since the last settlement logged in the VPOS terminal
creditCnt	Total Credit Count since the last settlement logged in the VPOS terminal
debitAmt	Total Debit Amount since the last settlement logged in the VPOS terminal
debitCnt	Total Debit Count since the last settlement logged in the VPOS terminal

Note: Accum Review is a local function, as opposed to Balance Inquiry which is done over the Internet with the host.

Adjust

URL Functionality: Corrects the amount of a previously completed transaction.

GET Arguments: None

GET Results: Because the Adjust transaction modifies data on the merchant server, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

pvsTxnNum	Previous transaction number
txnAdjustedAmount	The adjusted transaction amount. Note that the original transaction amount is easily retrievable from the previous transaction number.

POST Results: On success, pvsTxnNum and txnAdjustedAmount are presented in the HTML document, in addition to the transaction fields described above.

Auth Capture

URL Functionality: This transaction is a combination of Auth Only (Authorization without capture) and Forced Post transactions.

GET Arguments: None

GET Results: Because the Auth Capture transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described above is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into a VPOS Terminal transaction log for both instances.

Auth Only

URL Functionality: Validates the cardholder's account number for a Sale that is performed at a later stage. The transaction does not confirm the sale to the host, and there is no host data capture. The VPOS captures this transaction record and later forwards it to confirm the sale in the Forced Post transaction request.

GET Arguments: None.

GET Results: Because the Auth Only transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into VPOS Terminal transaction log for both instances.

NOTE: The /VPOSt/ci/authonly/ URL should be used for customer-initiated transactions. /VPOSt/mi/authonly/ should be used for merchant-initiated transactions.

Balance Inquiry

URL Functionality: Performs an on-line inquiry or the merchant's balance.

GET Arguments: None

GET Results:

mrchtBlnceA mt Merchant balance amount for a given merchant. The balance amount at any given time is the difference between the credit and debit amount since the last settlement between the merchant and the acquirer.

Batch Review

URL Functionality: Retrieves all records from the transaction log or the batch.

GET Arguments: None

GET Results: The GET method retrieves the transactions that have been batched in the VPOS terminal for future reconciliation. The batch can be cleared from the VPOS terminal after a manual reconciliation between the acquirer and the VPOS. The batch data is retrieved as a set of records and is formatted as a table in the HTML document. The following fields are present in a typical record:

nTransType	Transaction type
nPurchOrderNo	Purchase order number
szAcctNum	Customer's payment instrument account number
szExpDate	Customer's payment instrument expiration date
sZTransAmt	Transaction amount
sZTransDate	Transaction date
sZTransTime	Transaction time
szRetrievalRefNum	Transaction's retrieval reference number
szAuthId	Authorization ID for the transaction
szOrigAmt	Original transaction amount
szBatchNum	Batch number for the given transaction
nCurrencyType	Currency in which the transaction was done
lnTransNum	Transaction number

CDT Review

URL Functionality: Displays the VPOS terminal configuration data corresponding to the Card Definition Table (CDT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /VPOSt/mi/cdt/update/ URL to update the card definition table. Not all fields in the card definition table are editable. The following fields are returned in a form to the user:

nHostIndex	Index into the Host Definition Table or the acquirer that maps to this card issuer.
szPANLo	Low end of the PAN (Primary Account Number) range
szPANHi	High end of the PAN range
nMaxPANDigit	Maximum number of digits in the PAN for this acquirer.
NMinPANDigit	Minimum number of dits in the PAN for the acquirer
szCardLabel	Card Issuer's name
Transactions Available bit vector	Specifies if a particular transaction is allowed for a given card range.

(Some of these fields are not editable by a merchant, and still need to be determined.)

CDT Update

URL Functionality: Updates the VPOS terminal configuration data corresponding to the Card Definition Table (CDT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /VPOSt/mi/cdt/update URL to update the card definition table.

POST Arguments: (Editable CDT fields need to be decided.)

POST Results: (Depends on editable CDT fields, and therefore needs to be decided.)

Clear Accumulator

URL Functionality: Zeroes out the accumulator totals currently resident in the VPOS terminal.

GET Arguments: None.

GET Results: Presents a form that uses the POST method to zero the accumulators.

POST Arguments: None.

POST Results: Zeroes the accumulators/transaction totals in the VPOS terminal.

Clear Batch

URL Functionality: Zeroes out the transaction logs currently batched in the VPOS terminal.

GET Arguments: None.

GET Results: Presents a form that uses the POST method to clear the batch.

POST Arguments: None.

POST Results: Zeroes the transactions that comprise the batch in the VPOS terminal.

Forced Post

URL Functionality: Confirms to the host the completion of a sale, and requests for data capture of the transaction. This is used as a follow-up transaction after doing an Authorization (Online or Off-line) transaction.

GET Arguments: None.

GET Results: Returns the HTML form for performing the Forced Post transaction.

POST Arguments:

pvsTxnNum the previous transaction number from an auth only transaction

POST Results: On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

HDT Review

URL Functionality: Displays the VPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /VPOSt/mi/hdt/update URL to update the hosts definition table. Not all fields in the host definition table are editable. The following fields are returned in a form to the user:

szTermId	Terminal ID for this VPOS terminal
szMerchId	Merchant ID for this VPOS terminal
szCurrBatchNum	Current batch number existing on the VPOS
szTransNum	Reference number for the next transaction in the VPOS transaction log/batch. This is generated by VPOS and is not editable by the merchant.
szTPDU	Transport Protocol Data Unit. Required for building the ISO 8583 packet.
InSTAN	System trace number, message number of the next transaction to be transmitted to this acquirer.
szNII	Network International Number. Required for building the ISO 8583 packet.
szHostName	Name for identifying the host.
nHostType	Host type
nNumAdv	Number of off-line transactions that can be piggy-backed at the end of an on-line transaction.
Data Capture Required Bit vector:	Specifies for which transactions data capture is required.

(Some of these fields are not editable by a merchant and need to be determined.)

HDT Update

URL Functionality: Updates the VPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted to the merchant server using the /VPOSt/mi/hdt/update URL to update the host definition table.

Unlock VPOS

URL Functionality: Local function that starts the VPOS at the start of the day.

GET Arguments: None.

GET Results: Returns an HTML form that uses the POST method to perform this transaction.

POST Arguments: None.

POST Results: Resets a Boolean flag on the merchant server that enables transactions to be accepted by the VPOS terminal.

Offline Auth

URL Functionality: This transaction is same as the "Authorization Only" transaction, except that the transaction is locally captured by the VPOS terminal without having to communicate with the host. A Forced Post operation is done as a follow-up operation of this transaction.

GET Arguments: None.

GET Results: Because the Offline Auth transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form for using the POST method to perform the transaction.

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described in Section 4.1 is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into VPOS terminal transaction log for both instances.

Parameter Download

URL Functionality: Downloads the VPOS configuration information from the host and sets up the VPOS in the event of the configuration data being changed.

GET Arguments: None

GET Results: Retrieves an HTML form that uses the POST method for the parameter download transaction.

POST Arguments: None.

POST Results: Downloads the following parameters from the host and uploads them into the VPOS terminal configuration table.

card/issuer definition table (CDT)

host/acquirer definition table (HDT)

communications parameter table (CPT)

terminal configuration table (TCT)

The various configuration parameters can be reviewed and modified using the URLs for the desired functionality.

Pre Auth

URL Functionality: Used in lodging and hotel establishments to pre-authorize a charge that is completed some time in future.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the pre-authorizaton transaction. POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date

Pre Auth Comp

URL Functionality: Completes a pre-authorization transaction.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the pre-authorization completion transaction.

POST Arguments:

pvsTxnNum Previous transaction number from an auth only transaction

POST Results: On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

Reconcile

URL Functionality: This transaction is done at the end of the day to confirm to the host to start the settlement process for the transactions captured by the host for that particular VPOS batch.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the Reconcile transaction.

POST Arguments: None.

POST Results: On success, the reconcile function prints any discrepancies in the merchant's batch of transactions and totals vis-a-vis the host's batch of transactions in totals. The output format is a combination of the output of the Batch Review and Accum Review transactions.

Return

URL Functionality: Credits the return amount electronically to the consumer's account when previously purchased merchandise is returned. The VPOS terminal captures the transaction record for this transaction.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the Return transaction.

POST Arguments:

prevTxnNum Reference to the previous transaction number

The previous transaction has access to the following fields:

txnAmount	Transaction amount
piAccountNum	Payment instrument account number
piExpDate	Payment instrument expiration date

POST Results: On success, pvsTxnNum is presented in the HTML document, in addition to

Test Host

URL Functionality: Checks the presence of the host and also the integrity of the link from the VPOS to the host.

GET Arguments: None.

GET Results: On success, an HTML document is returned that reports success in connecting to the host. On failure, an HTML document is returned that reports the error encountered in testing the host.

Lock VPOS

URL Functionality: This local function locks or stops the VPOS terminal from accepting any transactions.

GET Arguments: None.

GET Results: Returns an HTML form that posts the locking of the VPOS terminal.

POST Arguments: None.

POST Results: On success, an HTML document is returned that contains the status that VPOS terminal was successfully. On failure, an HTML document is returned that reports the cause of failure of the operation, e.g., access denied, the VPOS terminal is already locked or is presently processing a transaction, etc.

Void

URL Functionality: Cancels a previously completed draft capture transaction.

GET Arguments: None.

GET Results: Retrieves an HTML form for posting the Void transaction.

POST Arguments:

pvsTxnNum Transaction number from a previous Auth Only transaction.

Host Logon

URL Functionality: Administrative transaction used to sign-on the VPOS with the host at the start of the day, and also to download encryption keys for debit transactions.

GET Arguments: None

GET Results: Retrieves an HTML form for posting the Host Logon transaction.

POST Arguments: None.

POST Results: Currently, debit card based transactions are not supported. The result is an HTML document indicating the success or failure of the host logon operation.

CPT Review

URL Functionality: Returns the VPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values corresponding to the VPOS terminal's communication parameters. The form can be filled out and posted to the merchant server using the /VPOSt/mi/cpt/update URL to update the communications parameter table. The following fields are returned in a form to the user:

szAcqPriAddress	Primary Host address
szAcqSecAddress	Secondary Host address
szActTerAddress	Tertiary Host address
nRespTimeOut	Time-out value (in seconds) before which the VPOS should receive a response from the host

CPT Update

URL Functionality: Updates the VPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted to update the communication parameter table.

POST Arguments:

szAcqPriAddress	Primary Host address
szAcqSecAddress	Secondary Host address
szActTerAddress	Tertiary Host address
nRespTimeOut	Time-out value (in seconds) before which the VPOS should receive a response from the host

POST Results: On success, the HTML document returned by the VPOS contains the values set by the merchant. On failure, the HTML document contains the reason for the failure of the invocation of the URL.

TCT Review

URL Functionality: Returns the VPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None.

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /VPOSt/mi/cpt/update URL to update the terminal configuration table. The following fields are returned in a form to the user:

szMerchName	Merchant name
szSupervisorPwd	Supervisor password
fVPOSLock	1 = VPOS locked, 0 = VPOS unlocked
szAuthOnlyPwd	Password for initiating auth-only transaction
szAuthCaptPwd	Password for initiating auth with capture transaction
szAdjustPwd	Password for adjust transaction
szRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompPwd	Password for pre-authorization completion

TCT Update

URL Functionality: Updates the VPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /VPOSt/mi/tct/update URL to update the terminal configuration table.

POST Arguments: All arguments in TCT Review functionality are the returned values from the /VPOSt/mi/tct/update the URL.

szMerchName	Merchant name
szSupervisorPwd	Supervisor password
fVPOSLock	1 = VPOS locked, 0 = VPOS unlocked
szAuthOnlyPwd	Password for initiating auth-only transaction
szAuthCaptPwd	Password for initiating auth with capture transaction
szAdjustPwd	Password for adjust transaction
szRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompPwd	Password for pre-authorization completion

POST Results: On success, the POST modifies values of the terminal configuration table parameters. On failure, the HTML document contains the reason for the failure of the transaction.

Query Transactions

URL Functionality: Permits the merchant and customer to query a given transaction corresponding to a transaction number.

GET Arguments:

txnNum Transaction number

GET Results: For a given transaction, the URL returns an HTML document. If a transaction refers to an older transaction, the transaction's entire history is made available.

URL Results

Depending upon the method (GET/POST) as well as the success or failure of the HTTP request, different documents are returned to the user. The VPOS terminal provides a framework whereby different documents are returned based upon a number of preferences. Currently the language and content-type are supported as preferences.

A simple framework is proposed here. Each of the transaction has a set of documents associated with it: form for the payment transaction, GET success, GET failure, POST success, and POST failure.

In the directory structure defined below, documents are stored corresponding to the preferences. The top level of the directory structure is the content-type, the next level is language (for NLS support). For example, to create text/html content in US English & French, the directory structure given below would contain the HTML documents for each of the transactions. The VPOS terminal cartridge has a configuration file that allows the user to specify the content-type as well as the language to be used for a cartridge. The first release of the VPOS terminal cartridge supports one content-type and language for each server.

Data Structures & Functions

Functions

A brief description of the Virtual Point of Sale Terminal cartridge functions are provided below. VPOSTInit( ),

VPOSTExec( ) and VPOSTShut( ) are the entry points required for each cartridge in accordance with a preferred embodiment. The other functions implement some of the key VPOST cartridge functionality. A source listing of the VPOS code is provided below to further accentuate the detailed disclosure of a preferred embodiment.

VPOSTInit()

```
/* VPOST cartridge Initialization here */
WRBReturnCode
VPOSTInit( void **clientCtx ){
        VPOSTCtx *VPOSTCxp ;
        /* Allocate memory for the client context */
        if (!(VPOSTCxp = (VPOSTCtx *)malloc(sizeof(VPOSTCtx))))
                return WRB_ERROR ;
            *clientCtx = (void *)VPOSTCxp ;
            return (WRB_DONE) ;}
```

VPOSTShut()

```
WRBReturnCode
VPOSTShut( void *WRBCtx, void *clientCtx ){
            *WRBCtx ; /* not used */
            assert( clientCtx ) ;
            /* Free the client context allocated in VPOSTInit() routine
                                    free( clientCtx ) ;
                                return (WRB_DONE) ;}
```

VPOSTExec()

```
/* The driver cartridge routine */
WRBReturnCode
VPOSTExec( void *WRBCtx, void *clientCtx )
{
            VPOSTCtx    *VPOSTCxp ;
            char        *uri;
            char        *txnMethod; /* HTTP method */
            enum eVPOSTTxn      *txn ; /* VPOST transaction */
            char        *txnOutFile ; /* Output file from transaction */
            char        **txnEnv ; /* environment variables values for transaction */
            char        *txnContent ; /* transaction's POST data content */
            WRBEntry    *WRBEntries ;
            int         numEntries;
            VPOSTCxp = (VPOSTCtx *) clientCtx ;
            /* WRBGetURL gets the URL for the current request */
            if (!(uri = WRBGetURL( WRBCtx )))
                    return (WRB_ERROR) ;
            /* WRBGetContent() gets the QueryString/POST data content */
            if (!(txnContent = WRBGetContent( WRBCtx ))) {
                    return WRB_ERROR;
        }
            /* WRBGetParserContent() gets the parsed content */
            if (WRB_ERROR == WRBGEtParsedContent( WRBCtx, &WRBEntries,
            &numEntries)) {
                    return WRB_ERROR ;
        }
        /* WRBGetEnvironment() gets the HTTP Server Environment */
        if (!(txnEnv = WRBGetEnvironment( WRBCtx))) {
            return WRB_ERROR;
        }
            /* VPOSTGetMethod() gets the method for the current request */
            if (!(method = VPOSTGetMethod( txnEnv ))){
                return (WRB_ERROR) ;
            }
            /* VPOSTGetTxn() gets the VPOST transaction for the request */
            txn = VPOSTGetTxn( uri );
            if (eTxnError == txn) {
                return (WRB_ERROR) ;
            }
            /* VPOSTExecuteTransaction() executes the VPOST transaction */
            txnOutFile = VPOSTExecuteTransaction( WRBCtx, txn, txnMethod,
              txnEnv, txnContent) ;
            if (!(txnOutFile)) {
                return (WRB_ERROR) ;
            }
            /* Write out the file */
            VPOSTWriteFile( txnOutFile ) ;
            return (WRB_DONE) ;
}
```

VPOSTGetTxn()

```
enum eVPOSTTxn
VPOSTGetTxn( char *uri )
```

-continued

```
{
        /*
      * The function scans the uri and extracts the string
      * corresponding to the transaction and returns it to the
      * caller.
      */
}
```

Transaction Log Format

This section describes the format of a record for the transaction log for the VPOST cartridge.

nTransType	Transaction Type
nPurchOrderNo	Purchase Order Number
szAcctNum	Payment Instrument Account number
szExpDate	Payment instrument expiration date
szTransAmt	Transaction amount
szTransDate	Date of transaction (configurable to be mm/dd/yy or dd/mm/yy)
szTransTime	Time of transaction (configurable to be GMT or local time)
szRetrievalRefNum	Retrieval reference number
szAuthId	Authorization ID
szOrigAmt	Original transaction amount
szBatchNum	Batch number to which this particular transaction belongs in the VPOST batch
nCurrencyType	Currency
lnTransNum	Transaction number

In the block diagram shown in FIG. **15B**, the VPOS provides an interface for transactions which are initiated both by the consumer and the merchant. The merchant initiates a transaction from a Graphical User Interface (GUI) **1550** and all the transactions that are initiated by the consumer are routed by the Merchant WEB Server **1545**.

The Authorization/Data Capture Module **1560** processes the requests originated by the merchant or the consumer and routes them to the Protocol Module **1565**. The Protocol Module is responsible for building the payment protocol request packet (e.g., an SSL-encapsulated ISO 8583 packet) **1570** before sending the request to the Gateway **1579**. Then, the Gateway **1579** awaits a response from the Protocol Module **1565**, and upon receiving the response, the Gateway **1579** parses the data and provides unwrapped data to the Authorization/Data-Capture Module **1560**. The Authorization/Data-Capture Module **1560** analyzes the response and updates the Transaction Log **1580**. The Transaction Log **1580** contains information concerning any successfully completed transactions and the accumulators or the transaction totals. The VPOS terminal creates and maintains the Transaction Log **1580**, and the VPOS Configuration Data **1585** contains information which is used to configure the behavior of the VPOS. The entire VPOS functionality is thread-safe and hence using the VPOS in a multi-threaded environment does not require any additional interfacing requirements.

FIGS. **36–48** are VPOS screen displays in accordance with a preferred embodiment.

Payment Functionality

As discussed above, the different Payment Functionality provided by the VPOS terminal can be divided into two main categories as "Merchant Initiated" and "Consumer Initiated." Some of these transactions require communication with the Gateway and these transactions are referred to as "Online Transactions." The transactions which can be done locally to the merchant without having to communicate are referred to as "Local Functions/Transactions." In order to provide support for many different types of Payment Instruments, the VPOS Payment Functionality have been categorized.

Host payment functionality and transactions require communication with the host either immediately or at a later stage. Each of the host financial payment transactions come to this category and require a Payment Instrument. These transactions can be initiated with different types of Payment Instruments which the VPOS terminal supports.

An authorization without capture transaction is used to validate the card holder's account number for a sale that needs to be performed at a later stage. The transaction does not confirm a sale's completion to the host, and there is no host data capture in this event. The VPOS captures this transaction record and later forwards it to the host to confirm the sale in a forced post transaction request. An authorization without capture transaction can be initiated both by the consumer and the merchant.

A forced post transaction confirms to a host computer that a completion of a sale has been accomplished and requests data capture of the transaction. The forced post transaction is used as a follow-up transaction after doing an authorization (Online or Off-line) transaction. The transaction can be initiated only by the merchant.

The authorization with post transaction is a combination of authorization without capture and forced post transactions. This transaction can be initiated both by the consumer and the merchant.

The offline post transaction is identical to the "authorization without capture" transaction, except that the transaction is locally captured by the VPOS without initiating communication with a host. A forced post operation is done as a follow-up operation of this transaction. This transaction can be initiated by both the consumer and the merchant.

The return transaction is used to credit the return amount electronically to the consumer's account when a purchased merchandise is returned. The VPOS captures the return transaction record when the merchandise is returned, and this transaction can be initiated only by the merchant.

The void transaction cancels a previously completed draft capture transaction. The VPOS GUI provides an interface for retrieving a transaction record required to be voided from the batch and passes it to the Authorization/Data-Capture module after confirmation. The batch record is updated to reflect the voided transaction after getting an approval from the gateway. This transaction can be initiated only by the merchant.

The pre-authorization transaction is identical to the authorization without capture transaction, but the consumers' "open-to-buy" amount is reduced by the pre-authorization amount. An example of this type of transaction is the "check-in" transaction in a hotel environment. A check-in transaction sends a pre-authorization request to the host, so that an amount required for the customers' stay in the hotel

is reserved. The pre-authorization transaction is followed by a pre-authorization complete transaction. This transaction can be initiated both by the consumer and the merchant.

The pre-authorization complete transaction is done as a follow-up to the pre-authorization transaction. This transaction informs the host of the actual transaction amount. The pre-authorization complete transaction amount could be more or less than the pre-authorization amount. An example is the "check-out" transaction in a hotel environment. The check-out amount can be less than or more than the check-in amount. This transaction can only be initiated by a merchant.

The adjust transaction is initiated to make a correction to the amount of a previously completed transaction. The adjust transaction can be initiated only by the merchant. The host administrative transactions do not require any payment instrument. The balance inquiry transaction is used for on-line inquiry into the balance of the merchant's account. The batch data or the configuration data is not affected by this transaction.

The reconciliation or close transaction is processed at the end of the day to start the settlement process for the transactions captured by the host for that particular VPOS.

The host log-on transaction is an administrative transaction which is used to synchronize the VPOS with the host at the start of the day and also initiate a fresh batch at the VPOS terminal.

The parameters download transaction is used to download the VPOS configuration information from the host and set-up the VPOS in the event of any change in the configuration data. A test transaction is used to detect the presence of a host and the status of a link from the VPOS to the host.

Local transactions or functions are initiated by a merchant and do not require communication with the gateway. These transactions can only be initiated by a merchant. The totals or accumulators review is a local information inquiry function and is used to retrieve the local (merchant's) totals. The detail transaction or the batch review function is used to retrieve all the records from the transaction log or the batch. The clear batch function is used to start a fresh batch. This transaction is utilized to electronically reconcile the VPOS with the host and to manually reconcile the VPOS with the host. After completing the manual reconciliation processing, the merchant can initiate this transaction to start a fresh batch.

The clear accumulator function is similar to the clear batch functionality and resets all VPOS terminal accumulators to zero. This function is required when the merchant is not able to reconcile the VPOS with the host electronically.

The VPOS unlock or start transaction is a local function used to start the VPOS at the start of the day. The VPOS lock or stop function is used to Lock or stop the VPOS from accepting any transactions. The VPOS configuration setup function is used to setup the VPOS configuration data. The VPOS configuration data is divided into different tables, for example, the Card/Issuer Definition Table (CDT), the Host/acquirer Definition Table (HDT), the Communications Parameters Table (CPT) and the Terminal Configuration Table (TCT). The following sections explain each of these configuration tables in detail.

Payment Instruments

As discussed above, the VPOS terminal supports different Payment Instruments and each of the Payment Functions described above can be initiated by these different Payment Instruments. The consumer making a purchase from a merchant provides a choice of payment methods depending upon their personal preference. The Payment Instrument Class Hierarchy which is used by the different VPOS terminal Payment Functions is described below.

Message Sequence Diagram

FIG. **17** shows a typical message flow between the consumer, merchant, VPOS terminal and the Gateway. This section describes the different classes listed in the previous section, their data and members, and defines the type of the transaction that is to be performed. Processing commences at **1700** when a merchant server receives a sales order and passes it via the VPOS Graphical User Interfece (GUI) **1710** to an authorizer **1720** for approval and subsequent protocol processing **1730** and ultimately transmission via the gateway **1740** to the network.

Class Name : CVPCLTransaction
Data : Transaction Type (int) Transaction Date and Time (CPCLDateTime) Card Definition Table (CVPCL_CDT) Host Definition Table (CVPCL_HDT) Communications Parameters Table (CVPCL_CPT) Terminal Configuration Parameters (CVPCL_TCT) Batch Record (CVPCLBatch) Accumulator Record (CVPCLAccum)

Member Functions :
CVPCLTransaction();
EStatus GetTransType();
EStatus GetTransDateTime(CPCLDateTime&);
EStatus SetTransType(const int);
virtual EStatus InitializeTrans(TVPOSParamsBlk *) = 0;
virtual EStatus ExecuteTrans(TVPOSResultsBlk *) = 0;
virtual EStatus ShutDown() = 0;

Host Transaction Class Definitions

This section contains all the host transaction class definitions.

Host Transaction Class (CVPCLHostTrans)

This is an abstract base class derived from the CVPCLTransaction class and is used for deriving transaction classes which need to communicate with the host either immediately or at a later stage.

Class Name : CVPCLHostTrans
Data : Member Functions : CVPCLHostTrans();

Financial Transaction Class (CVPCLFinancialTrans)

This is an abstract base class derived from the CVPCLHostTrans. This class is used to derive transaction classes which require a payment instrument (e.g., a Credit Card) associated with them to perform the transaction.

Class Name : CVPCLFinancialTrans
Data : Transaction Amount (CVPCLAmt) Purchase Order Number (char[]) Transaction Number (char[]) Authorization Identification Number (char[]) Retrieval Reference Number (char[]) Batch (CVPCLBatch) Accumulators (CVPCLAccumulators) Member Functions : CVPCLFinancialTrans(); EStatus GetTransAmt(CVPCLAmt&); EStatus GetPurchOrderNum(char *); EStatus GetTransRefNum(char *); EStatus GetRetRefNum(char *); EStatus GetAuthId(char *); EStatus GetCurrencyType(EPCLCurrency *); EStatus SetPurchOrderNum(const char *); EStatus SetTransRefNum(const char *); EStatus SetRetRefNum(const char *); EStatus SetAuthId(const char *); EStatus SetCurrencyType (const char *)

Financial Credit Card Transaction Class (CVPCLFinCCTrans)

This is the base abstract class for the financial host transaction which require a Credit Card payment instrument. This class is derived from the CVPCLFinancialTrans.

Class Name : CVPCLFinCCTrans
Data : Credit Card Payment Instrument (CPCLCreditCard) Member Functions : CVPCLFinCCTrans();

Credit Card Authorization Only Transaction Class (CVPCL_CCAuthOnly)

This is the class derived from the CVPCLFinCCTrans class and implements the Authorization Only Transaction.

Class Name : CVPCL_CCAuthOnly
Data : Member Functions : CVPCL_CCAuthOnly(); EStatus InitializeTrans(TVPOSParamsBlk *); EStatus ExecuteTrans(TVPOSResultsBlk *); EStatus ShutDownTrans(); EStatus FormBatchRec();

Credit Card Authorization with Capture Transaction Class (CVPCL_CCAuthCapt)

This is the class derived from the CVPCLFinCCTrans class and implements the Authorization with Data Capture Transaction.

Class Name : CVPCL_CCAuthCapt
Data : Member Functions : CVPCL_CCAuthCapt(); EStatus InitializeTrans(TVPOSParamsBlk *); EStatus ExecuteTrans(TVPOSResultsBlk *); EStatus ShutDownTrans(); EStatus FormBatchRec();

Credit Card Return Transaction Class (CVPCL_CCReturn)

This is the class derived from the CVPCLFinCCTrans class and implements the Return Transaction.

Class Name : CVPCL_CCReturn
Data : Member Functions : CVPCL_CCReturn(); EStatus InitializeTrans(TVPOSParamsBlk *); EStatus ExecuteTrans(TVPOSResultsBlk *); EStatus ShutDownTrans(); EStatus FormBatchRec();

Credit Card Pre-Authorization Transaction Class (CVPCL_CCPreAuth)

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Transaction.

Class Name : CVPCL_CCPreAuth
Data : Member Functions : CVPCL_CCPreAuth(); EStatus InitializeTrans(TVPOSParamsBlk *); EStatus ExecuteTrans(TVPOSResultsBlk *); EStatus ShutDownTrans(); EStatus FormBatchRec();

Credit Card Off-line Authorization Only Transaction Class (CVPCL_CCOfflineAuth)

This is the class derived from the CVPCLFinCCTrans class and implements the Offline Authorization Class Transaction.

Class Name : CVPCL_CCOfflineAuth
Data : Member Functions : CVPCL_CCOfflineAuth(); EStatus InitializeTrans(TVPOSParamsBlk *); EStatus ExecuteTrans(TVPOSResultsBlk *); EStatus ShutDownTrans(); EStatus FormBatchRec();

Credit Card Adjust Transaction Class (CVPCL_CCAdjust)

This is the class derived from the CVPCLFinCCTrans class and implements the Adjust Transaction.

```
Class Name :
CVPCL_CCAdjust
Data :
Member Functions :

CVPCL_CCAdjust();
EStatus InitializeTrans(TVPOSParamsBlk *);
EStatus ExecuteTrans(TVPOSResultsBlk *);
EStatus ShutDownTrans();
EStatus FormBatchRec();
```

Credit Card Void Transaction Class (CVPCL_CCVoid)

This is the class derived from the CVPCLFinCCTrans class and implements the Void Transaction.

```
Class Name:
    CVPCL_CCVoid
Data:
Member Functions:
    CVPCL_CCVoid();
    EStatus InitializeTrans(TVPOSParamsBlk *);
    EStatus ExecuteTrans(TVPOSResultsBlk *);
    EStatus ShutDownTrans();
    EStatus FormBatchRec();
```

Credit Card Forced Post Transaction Class (CVPCL_CCForcedPost)

This is the class derived from the CVPCLFinCCTrans class and implements the Forced Post Transaction.

```
Class Name:
    CVPCL_CCForcedPost
Data:
Member Functions:
    CVPCL_CCForcedPost();
    EStatus InitializeTrans(TVPOSParamsBlk *);
    EStatus ExecuteTrans(TVPOSResultsBlk *);
    EStatus ShutDownTrans();
    EStatus FormBatchRec();
```

Pre-Authorization Complete Transaction Class (CVPCL_CCPreAuthComp)

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Completion Transaction.

```
Class Name:
    CVPCL_CCPreAuthComp
Data:
Member Functions:
    CVPCL_CCPreAuthComp();
    EStatus InitializeTrans(TVPOSParamsBlk *);
    EStatus ExecuteTrans(TVPOSResultsBlk *);
    EStatus ShutDownTrans();
    EStatus FormBatchRec();
```

Credit Card Balance Inquiry Class (CVPCL_CCBalanceInq)

This class is derived from the CVPCLFinCCTrans class and is used to perform the Merchant Balance Inquiry function.

```
Class Name:
    CVPCL_CCBalanceInq
Data:
Member Functions:
    CVPCL_CCBalanceInq();
    EStatus InitializeTrans(TVPOSParamsBlk *);
    EStatus ExecuteTrans(TVPOSResultsBlk *);
    EStatus ShutDownTrans();
```

Administrative Host Transaction Class (CVPCLAdminHostTrans)

This is an abstract base class derived from the CVPCLHostTrans class and is used to derive the administrative host transaction classes.

```
Class Name:
    CVPCLAdminHostTrans
Data:
Member Functions:
    CVPCLAdminHostTrans();
    int GetHostIndex();
    EStatus SetHostIndex (const int);
```

Reconcile Transaction Class (CVPCLReconcile)

This is the class derived from the CVPCLAdminHostTrans class and implements the Reconcile or Close functionality.

```
Class Name:
    CVPCLReconcile
Data:
Member Functions:
    CVPCLReconcile();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Host Log-on Transaction Class (CVPCLHostLogon)

This is the class derived from the CVPCLAdminHostTrans class and implements the Host Log-on Transaction.

```
Class Name:
    CVPCLHostLogon
Data:
Member Functions:
    CVPCLHostLogon();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Parameters Download Transaction Class (CVPCLParamsDwnld)

This is the class derived from the CVPCLAdminHostTrans class and implements the Parameters Download (VPOS configuration information from the host) functionality.

```
Class Name:
    CVPCLParamsDwnld
Data:
Member Functions:
    CVPCLParamsDwnld();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Test Transaction Class (CVPCLTestHost)

This is the class derived from the CVPCLAdminHost-Trans class and implements the Test functionality which is used to test the host and the link.

```
Class Name:
    CVPCLTestHost
Data:
Member Functions:
    CVPCLTestHost()
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Local Transaction Class Definitions (CVPCLLocalTrans)

This is the abstract base class for all the transactions that are performed locally to the VPOS.

```
Class Name:
    CVPCLLocalTrans
Data:
    Record Number (int)
    Host Index (int)
Member Functions:
    CVPCLocalTrans();
        int GetRecNum();
        int GetHostIndex()
        EStatus SetRecNum(const int);
        EStatus SetHostIndex(const int);
```

Virtual POS Lock/Stop Class (CVPCLVPOSLock)

This class implements the VPOS Lock or the Stop Local functionality. Under the locked state the VPOS does not accept any transaction requests. The class is derived from the CVPCLLocalTrans base class.

```
Class Name:
    CVPCLVPOSLock
Data:
Member Functions:
    CVPCLVPOSLock();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Virtual POS UnLock/Start Class (CVPCLVPOSUnlock)

This class implements the VPOS UnLock or the Start Local functionality. The class is derived from the CVP-CLLocalTrans base class.

```
Class Name:
    CVPCLVPOSUnLock
Data:
Member Functions:
    CVPCLVPOSUnlock();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Transaction Data Administration Class (CVPCLTransDataAdmin)

This is an abstract base class used to derive the classes which are required to review/manage the transaction data which includes the batch data and the accumulator data. The class is derived from the CVPCLLocalTrans base class.

```
Class Name:
    CVPCLTransDataAdmin
Data:
Member Functions:
    CVPCLTransDataAdmin();
```

Batch Review Class (CVPCLBatchReview)

This class is derived from the CVPCLTransDataAdmin base class and implements the batch review functionality

```
Class Name:
    CVPCLBatchReview
Data:
Member Functions:
    CVPCLBatchReview();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Clear Batch Class (CVPCLClearBatch)

This class is derived from the CVPCLTransDataAdmin base class and implements the clear batch functionality, which is used to clear the batch in the event of doing a manual reconciliation between the VPOS and the acquirer.

```
Class Name:
    CVPCLClearBatch
Data:
Member Functions:
    CVPCLClearBatch();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Accumulators Review Class (CVPCLAccumReview)

This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Review functionality.

```
Class Name:
    CVPCLAccumReview
Data:
Member Functions:
    CVPCLAccumReview();
        EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans();
```

Clear Accumulators Class (CVPCLClearAccum)

This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Clear functionality.

```
Class Name:
    CVPCLClearAccum
Data:
Member Functions:
    CVPCLClearAccum( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

VPOS Configuration Data Administration Class (CVPCLConfigDataAdmin)

This is an abstract base class and is used to derive classes which implement the functionality for managing the VPOS configuration data. The class is derived from the CVPCLLocalTrans base class.

```
Class Name:
    CVPCLConfigDataAdmin
Data:
Member Functions:
```

Acquirer Data or the Host Definition Table Review Class (CVPCL_HDTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Host Definition Table Review functionality.

```
Class Name:
    CVPCL_HDTReview
Data:
Member Functions:
    CVPCL_HDTReview( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Issuer Data or the Card Definition Table Review Class (CVPCL_CDTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Card Definition Table Review functionality.

```
Class Name:
    CVPCL_CDTReview
Data:
Member Functions:
    CVPCL_CDTReview( );
```

-continued

```
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Communication Parameters Table Review Class (CVPCL_CPTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Communications Parameters Table Review functionality.

```
Class Name:
    CVPCL_CPTReview
Data:
Member Functions:
    CVPCL_CPTReview( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Terminal Configuration Table Review Class (CVPCL_TCTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Terminal Configuration Table Review functionality.

```
Class Name:
    CVPCL_TCTReview
Data:
Member Functions:
    CVPCL_TCTReview( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Acquirer Data or the Host Definition Table Update Class (CVPCL_HDTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the Host Definition Table Update functionality.

```
Class Name:
    CVPCL_HDTUpdate
Data:
Member Functions:
    CVPCL_HDTUpdate( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Issuer Data or the Card Definition Table Update Class (CVPCL_CDTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the Card Definition Table Update functionality.

```
Class Name:
    CVPCL_CDTUpdate
Data:
Member Functions:
```

-continued

```
    CVPCL_CDTUpdate( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Communications Parameters Table Update Class (CVPCL_CPTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the Communications Parameters Table Update functionality.

```
Class Name:
    CVPCL_CPTUpdate
Data:
Member Functions:
    CVPCL_CPTUpdate( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Terminal Configuration Table Update Class (CVPCL_TCTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the Terminal Configuration Table Update functionality.

```
Class Name:
    CVPCL_TCTUpdate
Data:
Member Functions:
    CVPCL_TCTUpdate( );
    EStatus InitializeTrans(TVPOSParamsBlk *);
        EStatus ExecuteTrans(TVPOSResultsBlk *);
        EStatus ShutDownTrans( );
```

Batch Class (CVPCLBatch)

This class defines the batch record and the operations which are performed on the batch.

```
Class Name:
  CVPCLBatch
Data:
  Batch Record Structure (TVPOSBatchRec)
 // Definition of the TVPOSBatchRec is as below,
typedef struct_VPOSBatchRec
{
    char szTransAmt[ ];
    char szTransDate[ ];
    char szTransTime[ ];
    char szRetrievalRefNum[ ];  // Trans. Ref. No. sent by the host
    char szAuthId[ ];           // Approval Code sent by the host
    char szOrigAmt[ ];          // Original amount for-Adjust
    char szPurchOrderNum[ ];
    char szBatchNum[ ];
    EPCLTransType TransType;
    EPCLPmtInst PmtInst;
    EPCLCurrency CurrencyType;
    EPCLDecimals NumDecDigits;
    unsigned int nTransRefNum;    // Running Ref. Number gen. by the
                                  //VPOS for every approved txn.
unsigned long lnSTAN;     // Sys. Trace Number incr. by VPOS
                                  // for every trans. that is trans. to host
    TPmtInstData PayInstData;
} TVPOSBatchRec;
```

-continued

```
Member Functions:
    CVPCLBatch( );
    EStatus SetTransType(const EPCLTransType);
    EStatus SetRetRefNum(const char *);
    EStatus SetAuthId(const char *);
    EStatus SetPurchOrderNum(const char *);
    EStatus SetTransRefNum(const long);
    EStatus SetTransAmt(const char *);
    EStatus SetBatchNum(const char *);
    EStatus SetSTAN(const long);
    EStatus SetDateMMDDYYYY(const char *);
    EStatus SetTimeHHMMSS(const char *);
    EStatus SetPmtInst(const EPCLPmtInst);
    EStatus SetCCAcctNum(const char *);
    EStatus SetCCExpDate(const char *);
    EStatus SetOrigAmt(const char *);
    EStatus GetBatchRec(TVPOSBatchRec *);
    EStatus InitBatch( );
    EStatus OpenBatch(const char *, FILE **, const char *);
    EStatus CloseBatch(FILE *);
EStatus AddBatchRec ( );              // Adds a record to the batch
EStatus GetBatchRec (const long);     // Gets a record from the batch
EStatus UpdateBatchRec (const long);  // Update batch record with NR
EStatus DeleteBatchRec (const long);  // Deletes the batch record
```

Accumulator Class (CVPCLAccum)

This class defines the Accumulator record and the operations on the accumulators.

```
Class Name:
    CVPCLAccum
Data:
    Credit Amount (char szCreditAmt[AMT_SZ + 1])
    Credit Count (int nCreditCnt)
    Debit Amount (char szDebit[AMT_SZ +1)
    Debit Count (int nDebitCnt)
Member Functions:
    int OpenAccum(int fHandle);
    int GetAccum (int nAccumType,
    int *pnAccumCnt, char *pszAccumAmt);
    int CloseAccum(int fHandle);
    int CleanAccum( );
```

Host Definition Table Class (CVPCL_HDT)

This class defines the Host Definition Table record and the operations on the table.

```
Class Name:
  CVPCL_HDT
Data:
  Host Definition Table Record Structure (TVPOSHDTRec)
  The TVPOSHDTRec structure contains the following fields,
 typedef struct_VPOSHDTRec
 {
    char szTermId[ ];
    char szMerchId[ ];
    char szBatchNum[ ];
    char szTPDU[ ];
    char szNII[ ];
    char szHostName[ ];
    EPCLHostProtType HostProtType;
    EPCLHostProtSubType HostProtSubType;
    // Data Capture Required Flags
    VPOSBool fAuthOnlyDC;
    VPOSBool fAuthCaptDC;
    VPOSBool fForcedPostDC;
    VPOSBool fAdjustDC;
    VPOSBool fReturnDC;
    VPOSBool fOfflineAuthDC;
    VPOSBool fVoidDC;
```

-continued

```
    VPOSBool fPreAuthDC;
    VPOSBool fPreAuthCompDC;
    unsigned int nNumAdv;    // Max. No. of piggy-back trans. allowed
    unsigned int nTransRefNum;
    unsigned long lnSTAN;      // Systems Trace Number
} TVPOSHDTRec;
Member Functions:
    CVPCL_HDT( );
    EStatus CleanHDT( );
    EStatus LoadHDTRec(const int);
    EStatus SaveHDTRec(const int);
    EStatus GetNumRecs(int *);
    EStatus GetHDTRec(TVPOSHDTRec *);
    EStatus GetTermId(char *);
    EStatus GetMerchId(char *);
    EStatus GetBatchNum(char *);
    EStatus GetTransRefNum(unsigned int *);
    EStatus GetTPDU(char *);
    EStatus GetNII(char *);
    EStatus GetHostName(char *);
    EStatus GetHostProtType(EPCLHostProtType *);
    EStatus GetHostProtSubType(EPCLHostProtSubType *);
    EStatus GetNumAdv(unsigned int *);
    EStatus GetSTAN(unsigned long *);
    EStatus GetAuthOnlyDC(VPOSBool *);
    EStatus GetAuthCaptDC(VPOSBool *);
    EStatus GetAdjustDC(VPOSBool *);
    EStatus GetReturnDC(VPOSBool *);
    EStatus GetForcedPostDC(VPOSBool *);
    EStatus GetOfflineAuthDC(VPOSBool *);
    EStatus GetVoidDC(VPOSBool *);
    EStatus GetPreAuthDC(VPOSBool *);
    EStatus GetPreAuthComPDC(VPOSBool *);
    EStatus SetHDTRec(TVPOSHDTRec *);
    EStatus SetTermId(const char *);
    EStatus SetMerchId(const char *);
    EStatus SetBatchNum(const char *);
    EStatus SetTransRefNum(const unsigned int);
    EStatus SetTPDU(const char *);
    EStatus SetSTAN(const unsigned long);
    EStatus SetNII(const char *);
    EStatus SetHostName(const char *);
    EStatus SetHostProtType(const EPCLHostProtType);
    EStatus SetHostProtSubType(const EPCLHostProtSubType);
    EStatus SetNumAdv(const int);
    EStatus SetAuthOnlyDC(const VPOSBool);
    EStatus SetAuthCaptDC(const VPOSBool);
    EStatus SetAdjustDC(const VPOSBool);
    EStatus SetReturnDC(const VPOSBool);
    EStatus SetForcedPostDC(const VPOSBool);
    EStatus SetOfflineAuthDC(const VPOSBool);
    EStatus SetVoidDC(const VPOSBool);
    EStatus SetPreAuthDC(const VPOSBool);
    EStatus SetPreAuthCompDC(const VPOSBool);
```

Card Definition Table Class (CVPCL_CDT)

This class defines the Card Definition Table record and the operations on the table.

```
Class Name:
  CVPCL_CDT
Data:
  Card Definition Table Record Structure (TVPOSCDTRec)
  The TVPOSCDTRec structure contains the following fields,
typedef struct _VPOSCDTRec
{
    char szPANLo[ ];
    char szPANHi[ ];
    char szCardLabel[ ];
    int nHostIndex;
    int nMinPANDigit;
    int nMaxPANDigit;
    // Transaction Allowed Flags
    VPOSBool fAuthOnlyAllwd;
    VPOSBool fAuthCaptAllwd;
    VPOSBool fForcedPostAllwd;
    VPOSBool fAdjustAllwd;
    VPOSBool fReturnAllwd;
    VPOSBool fOfflineAuthAllwd;
    VPOSBool fVoidAllwd;
    VPOSBool fPreAuthAllwd,
    VPOSBool fPreAuthCompAllwd;
} TVPOSCDTRec;
Member Functions:
    CVPCL_CDT( );
    EStatus CleanCDT( );
    EStatus LoadCDTRec(const int);
    EStatus SaveCDTRec(const int);
    EStatus GetNumRecs(int *);
    EStatus GetCDTRec(TVPOSCDTRec *);
    EStatus GetPANLo(char *);
    EStatus GetPANHi(char *);
    EStatus GetCardLabel(char *);
    EStatus GetCDTHostIndex(int *);
    EStatus GetMinPANDigit(int *);
    EStatus GetMaxPANDigit(int *);
    EStatus GetAuthOnlyAllwd(VPOSBool *);
    EStatus GetAuthCaptAllwd(VPOSBool *);
    EStatus GetAdjustAllwd(VPOSBool *);
    EStatus GetReturnAllwd(VPOSBool *);
    EStatus GetOfflineAuthAllwd(VPOSBool *);
    EStatus GetVoidAllwd(VPOSBool *);
    EStatus GetPreAuthAllwd(VPOSBool *);
    EStatus GetPreAuthCompAllwd(VPOSBool *);
    EStatus GetForcedPostAllwd(VPOSBool *);
    EStatus SetCDTRec(TVPOSCDTRec *);
    EStatus SetHostIndex(const int);
    EStatus SetMinPANDigit(const int);
    EStatus SetMaxPANDigit(const int);
    EStatus SetPANLo(const char *);
    EStatus SetPANHi(const char *);
    EStatus SetCardLabel(const char *);
    EStatus SetAuthOnlyAllwd(const VPOSBool);
    EStatus SetAuthCaptAllwd(const VPOSBool);
    EStatus SetAdjustAllwd(const VPOSBool);
    EStatus SetReturnAllwd(const VPOSBool);
    EStatus SetForcedPostAllwd(const VPOSBool);
    EStatus SetOfflineAuthAllwd(const VPOSBool);
    EStatus SetVoidAllwd(const VPOSBool);
    EStatus SetPreAuthAllwd(const VPOSBool);
  EStatus SetPreAuthCompAllwd(const VPOSBool);
```

Communications Parameters Table Class (CVPCL_CPT)

This class defines the communications parameters table and the operations on the table.

```
Class Name:
    CVPCL_CPT
Data:
    Communications Parameters Table Record Structure
    (TVPOSCPTRec)
    The TVPOSCPTRec structure contains the following fields,
 typedef struct_VPOSCPTRec
 {
    char szAcqPriAddress[ ];
    char szAcqSeqAddress[ ];
    char szAcqTerAddress[ ];
    int nRespTimeOut;
 } TVPOSCPTRec;
Member Functions:
    CVPCL_CPT( );
    EStatus CleanCPT( );
    EStatus LoadCPTRec(const int);
    EStatus SaveCPTRec(const int);
    EStatus GetNumRecs(int *);
    EStatus GetCPTRec(TVPOSCPTRec *);
    EStatus GetAcqPriAddess(char *);
    EStatus GetAcqSecAddress(char *);
    EStatus GetAcqTerAddress(char *);
```

-continued

```
EStatus GetRespTimeOut(int *);
EStatus SetCPTRec(TVPOSCPTRec *);
EStatus SetAcqPriAddress(const char *);
EStatus SetAcqSecAddress(const char *);
EStatus SetAcqTerAddress(const char *);
EStatus SetRespTimeOut(const int);
```

Terminal Configuration Table Class (CVPCL_TCT)

This class defines the VPOS terminal configuration parameters table and the operations on the table.

```
Class Name:
    CVPCL_TCT
Data:
    Terminal Configuration Table Record Structure (TVPOSTCTRec)
    The TVPOSTCTRec structure contains the following fields,
  typedef struct_VPOSTCTRec
  {
    char szMerchName[];
    VPOSBool fvPOSLock; / / VPOS Lock/Unlock Toggle Flag
  }TVPOSTCTRec;
Member Functions:
  CVPCL_TCT();
  EStatus LoadTCTRec();
  EStatus SaveTCTRec();
  EStatus CleanTCT();
  EStatus GetTCTRec(TVPOSTCTRec *);
  EStatus GetMerchName(char *);
  EStatus GetVPOSLock(VPOSBool *);
  EStatus SetMerchName(const char *);
  EStatus SetVPOSLock(const VPOSBool);
```

Amount Class (CVPCLAmount)

This class defines the amount data items and the operations on them.

```
Class Name:
    CVPCLAmount
Data.:
    Amount (char[])
    Currency Type (EPCLCurrency)
Member Functions:
    CVPCLAmount();
    EStatus Initialize(const CPCLAmount&);
    EStatus Initialize(const char *);
    EStatus Initialize(const long);
    void operator = (const char *);
    void operator = (const long);
  EStatus GetAmount(char *);
    operator const char * () const;
    operator const long ();
```

Payment Instruments Class (CPCLPmtInst)

This section defines the Payment Instrument Class hierarchy. FIG. **16** illustrates a transaction class hierarchy in accordance with a preferred embodiment.

```
Class Name:
    CPCLPmtInst
Data:
    Payment Instrument Type (EPCLPmtInst)
```

-continued

```
Member Functions:
    CPCLPmtInst();
    EStatus GetPmtInstType(EPCLPmtInSt *);
```

Bank Cards Class (CPCLBankCard)

This class is derived from the CPCLPmtInst class and implements the bank cards class.

```
Class Name:
    CPCLBankCard
Data:
    Account Number (char[])
    Expiration Date (CPCLDateTime)
  Index into the CDT table (int)
Member Functions:
    CPCLBankCard();
    EStatus Initialize();
    EStatus SetAcctNum(const char *);
    EStatus SetExpDate(const char *);
    EStatus GetAcctNum(char *);
    EStatus GetExpDate(char.*);.
    EStatus ValidateCard();
    int GetCDTIndex();
    VPOSBool DoLuhnCheck();
    VPOSBool DoCardRanging();
    EStatus DoValidateExpDate();
```

Credit Cards Class (CPCLCreditCard)

This class is derived from the CPCLBankCard class and has the same data and the methods as the CPCLBankCard class.

```
Class Name:
    CPCLCreditCard
Data:
Member Functions:
    CPCLCreditCard();
```

Debit Cards Class (CPCLDebitCard)

This class is derived from the CVPCLBankCard class and implements the debit card class.

```
Class Name:
    CPCLDebitCard
Data:
    Card Holder Encrypted PIN (char[])
Member Functions:
    CPCLDebitCard();
    EStatus GetEncryptedPIN(char *);
    EStatus SetEncryptedPIN(char *);
```

VPOS Class Library Interface and API Definition

This section explains the classes which provide the interface to the VPOS class library.

Data Structures Required for the VPOS Interface Class

Transaction Parameters Structure (TVPOSParamsBlk)—This structure is a subset of all the transaction parameters required for the different transactions.

```
typedef struct_VPOSParamsBlk
{
      char szTransAmt[];   // Without decimal point.
                           // Left most two digits implied to be decimal digits
char szPurchOrderNum[];
      char szRetRefNum[];
char szBatchNum[];
      char szNewBatchNum[];
      char szOrigAmt[];
      char szCPSData[]
      char szAuthId[]; // Auth Id for offline auth-only transaction
      int HostIndex;
      unsigned int nTransRefNum;
      VPOSBool fvPOSLock;
      ECPSDataType eCPSType;
      EPCLTransType TransType;
      EStatus TransResult;
      EPCLPmtInst PmtInst;
      EpCLCurrency CurrencyType;
      EPCLDecimals NumDecDigits;
      EVPCLAccumType AccumType;
      TPmtInstData PayInstData;
      union_VPOSConfigData
      {
        TVPOSHDTRec srHDTRec;
        TVPOSCDTRec srCDTRec;
        TVPOSCPTRec srCPTRec;
        TVPOSTCTRec srTCTRec;
      }VPOSConfigData;
      void *Context; // Context from the calling interface
      EStatus (*VPOSCallBack) (TVPOSResultsBlk*, void *);
}TVPOSParamsBlk;
```

Transaction Results Structure (TVPOSResultsBlk)—This structure contains all the fields returned from the host and other fields which are required for doing terminal data capture.

```
typedef struct VPOSResultsBlk
{
      char szNewBatchNum[];
      int nHostIndex;
      EStatus TransResult;
      TVPOSBatchRec srBatchRec;
      TVPOSAccumRec srAccumRec;
      char szCardLabel[];
      TVPOSHDTRec srHDTRec;
      TVPOSCDTRec srCDTRec;
      TVPOSCPTRec srCPTRec;
      TVPOSTCTRec srTCTRec;
}TVPOSResultsBlk;
```

The various status codes for the enumeration EStatus are detailed below.

VPOS Interface Class (CVPOSInterface)

This class provides the interface to the VPOS Transaction Class Library.

```
Class Name:
      CVPOSInterface
Data:
Member Functions:
      CVPOSInterface();
      // Creates the Transaction Object, takes care
      // of other initialization and executes the transaction.
      CVPCLTransaction *pclTransFactory(TVPOSParamsBlk *);
      EStatus DestroyTrans(CVPCLTransaction *);
```

VPOS API Definition

This section explains in the VPOS API which are required for interfacing with the VPOS Class Library. All the different VPOS transactions can be initiated using the API defined in this section.

VPOS Terminal Architecture

FIG. **25** is a block diagram of the VPOS Terminal Architecture in accordance with a preferred embodiment. The Internet **2500** provides the communication processing necessary to enable the VPOS Terminal architecture. The terminal interface CGI **2520** communicates via the Internet to provide information to the VPOS OLE Server **2550** which formats information in accordance with the VPOS API DLL **2560** which uses the protocol class DLL **2570** to flesh out the message for delivery to the Gateway Server **2580**. The collection of the VPOS OLE Server **2550**, VPOS API DLL **2560** and the Protocol Class DLL **2570** make up the VPOS Software Development ToolKit (SDK) which are used to enable VPOS applications for interfacing with an Operator **2540**.

VPOS/GATEWAY Architecture

The architecture of the Virtual Point of Sale (VPOS) and Virtual Gateway (GATEWAY) architecture maintains SET compliance while providing support for additional message types that are not enabled in SET. The architecture includes isolation of cryptographic details in a single module to facilitate single version government approval while maximizing the flexibility of the system for customization and facilitating transfer of updated versions on an acquirer specific basis. FIG. **18** is a block diagram of the extended SET architecture in accordance with a preferred embodiment. Processing commences at function block **1800** for a consumer-originated transaction via the World Wide Web (WWW) or **1810** for a merchant-originated transaction on the Internet. In either case control passes immediately to the WWW server **1820** for the transaction to be appropriately formatted and the appropriate interface page presented, whether the transaction is a store front **1822**, shopping cart **1824**, pay page **1826**, standard terminal administration **1828–1830** transaction, or an extended terminal transaction **1834**. If processing requires authentication of the transaction, then control passes through the Virtual Point of Sale (VPOS) Application Programming Interface (API) library **1840** for SET compliant transactions and through the VPOS API extensions library for extensions to the SET protocol. Then, at function block **1842**, if the transaction is SET compliant, and function block **1864** if the transaction is not SET compliant, a library of protocol stack information is used to conform the message before it is transmitted to a Gateway site for ultimate delivery to a bank host **1874** for authorization.

Extended SET messages are processed at the Gateway site on a two track basis with the division criteria being SET compliance (which will change over time as more functionality is put into SET) or SET extensions. Set compliant messages are processed via the protocol stack library **1862**, while SET extensions are processed via the protocol stack extension library **1864**. Then, at function block **1870** the gateway engine processes SET and Host specific code including gateway administration extensions **1872** that bypass the normal processing and flow directly from the merchant and consumer server **1820** to the gateway administration extensions **1872** to the Gateway Engine **1870**.

As described above, there are three channels by which messages are exchanged between VPOS **1846** and GATEWAY **1856**.

1. Standard SET Messages

The standard SET messages are originated by the merchant software either via a pay page **1826** directly controlled by the consumer, or via an operator interface consisting of

a set of HTML pages and associated executables launched by the pages (e.g. pay page **1826** and standard terminal administration **1828–1830**.)

Each SET message type (e.g., authorization v. capture) transmits a different set of data and each requires a different Protocol Data Unit (PDU) to describe its encoding. Examples of how Standard SET messages are encoded are given in the SET documentation previously incorporated by reference.

2. Extended SET Messages

The Extended SET messages are utilized as an "escape mechanism" to implement acquirer-specific messages such as settlement/reconciliation, employee logon/logoff, and parameter download. The messages are developed as a set of name-value pairs encapsulated in a PKCS-7 wrapper and wrapped in Multipurpose Internet Mail Extensions (MIME), described in a book by N. Borenstein & N. Freed, "RFC 1521: MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies" (September 1993). The name-value pairs can have arbitrary (8-bit) data, so arbitrary items can be passed through the extended SET channel, including executable programs and Dynamic Load Libraries (DLL)s.

FIG. **18B** illustrates a multipart MIME message with one Extended SET message and one Standard SET authorizing message. MIME is utilized as an outer wrapper **1890** to allow an Extended SET message **1891** to be transmitted as a component of messages embedded in one MIME multipart message. In this manner, a standard SET message can be sent with an Extended SET message in one VPOS/GATEWAY communication transaction.

Embedding the Extended SET messages in a PKCS-7 wrapper enables the same message authentication to occur as in standard SET messages. Thus, for SET-compliant and non-SET-compliant messages, the same mechanism may be used to restrict which entities the VPOS or Gateway will trust in any communications. An important concept in Extended SET is that all messages, of any type, are sent in a uniform name/value pair format, thus allowing a single Protocol Data Unit to suffice for any type of message sent through the Extended SET channel. Since arbitrary data may be sent this way, a mechanism must be provided to preclude the use of the Extended SET channel by parties other than approved financial institutions. If this is not ensured, then the NSA and the US Department of Commerce will not approve the software for export.

SET itself to some degree ensures that this Extended SET channel is used only by financial institutions. The protocol stack extension library only processes messages that have been signed by a financial institution SET certificate that is in turn signed by a payment instrument brand certificate (such as Visa or MasterCard). Stronger control over the Extended SET channel can be achieved by further restricting processing of messages to those signed (either instead of or in addition to the financial institution SET certificate) by a second certificate belonging to a third-party agency, either governmental or private (e.g., VeriFone, as manufacturer of the software).

In this way, a particular set of Extended SET messages can be implemented by Bank X, and a different set of messages by Bank Y. If a VPOS has an extended terminal transaction interface as shown in FIG. **18A** at block **1834** for Bank X, and has been configured to only accept messages from a Gateway with Bank X's certificate, then it will be able to communicate those messages to a Gateway that has the certificate for Bank X, and accepts messages of the types in Bank X's message set. The VPOS will not be able to connect to the Bank Y gateway, or to any other system that purports to communicate via Extended SET. This restriction is further secured by utilizing a public key certificate that is "hard wired" into VPOS, and which is distributed only to gateways that use the Extended SET mechanism.

FIG. **18C** is an example flowchart of message processing in accordance with a preferred embodiment. Processing commences at function block **1880** when a message is received by an HTTPS server or other listener and passed to decision block **1883** to determine if the sending VPOS has transmitted an authentic message and if the VPOS is authorized to communicate with this gateway. If the message is not authentic, then the message is logged as an error and the error is handled as shown in function block **1889**. If the message is authentic, then the message is decrypted at function block **1884** and the PDU parses the message into name/value pairs. Then, based on the message type and the extended SET version information, the remaining message is parsed at function block **1885** and the message is checked for conformance to the appropriate specification as shown at decision block **1887**. If the message does not conform, then it is logged and the error handled at function block **1889**. If the message conforms to the proper specification in decision block **1887** then the message is translated into the appropriate host format and sent to the host as shown in function block **1888**. Thus, when a gateway receives an incoming message from a VPOS and parses the Extended SET portion of the message, a single MIME message can transmit a SET message and/or an Extended Set Message.

An export license for the encryption can be obtained on a case-by-case basis, and since there will be potentially millions of VPOS's, it is desirable to obtain a commodities jurisdiction for the VPOS, to enable a single version of the VPOS (rather than one version for each bank) to be supported by the VPOS architecture. The architecture described here ensures that the single version of VPOS, no matter how it is configured with extended terminal transaction interfaces, cannot be used to communicate any data other than that contained in the extended SET messages that have been approved for export by the US government to be used exclusively for a specific bank.

FIG. **18D** is an example of a simple message between VPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. The message must contain the employee's logon ID, a password to be verified by the bank host computer, and the date and time as shown at **1894**.

While the contents of the message are shown without encryption in FIG. **18D**, it should be noted that the information (including the logon password) are SET encrypted inside the PKCS-7 wrapper **1894**. Certain fields may be designated as mandatory for an Extended SET message, to allow the Gateway or VPOS to decide how to handle the message. For the sake of clarity, in this message **1894**, only two fields, "messagetype" and "ESETversion", are mandatory. These fields inform the Gateway that this message is of type "logon," and that the VPOS is using version "1.0A" of the ESET message formats defined for the Gateway. In this embodiment, the length indicator "[5]" is used to distinguish the length (in bytes) of the field of type "messagetype" in the message. In this way, there are no special end-of-data characters, and therefore arbitrary data need not have any "escaped" characters.

It should be noted that using escaped characters will work equally well. Total message integrity is assured by the digital signatures in the PKCS-7 wrapper. This does not, however,

preclude the use of other checksumming schemes for additional pinpointing of transmission or encoding errors. The messagetype and ESETversion name/value pairs facilitate Gateway look up of what name/value pairs are expected in the "logon" message. Some name/value pairs may be mandatory, and others may be optional.

FIG. **18E** is an example of a simple message between VPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. In response to the logon request message from a VPOS, the Gateway may respond with a "logon accepted" message **1894**, as depicted in FIG. **18E**, which VPOS, upon receipt and authentication, then uses to unlock the terminal for that user.

FIG. **49** shows how the VPOS authenticates an incoming response to a request in accordance with a preferred embodiment. Processing commences at function block **4930** when a message is received by the HTTPS, SET server, or other listener that originated the request to which this response corresponds. The message is passed to decision block **4940** to determine if the sending Gateway has transmitted an authentic message and if the gateway is authorized to communicate with this VPOS. If the message is not authentic, then the message is logged as an error or possible attack and the error is handled as shown in function block **4970**. If the message is authentic, then the message is decrypted at function block **4950** and the PDU parses the message into name/value pairs. Then, based on the message type and the extended SET version information, the remaining message is parsed at function block **4960** and the message is checked for conformance to the appropriate specification as shown at decision block **4980**. If the message does not conform, then it is logged and the error handled at function block **4970**. If the message conforms to the proper specification in decision block **4980** then the message is translated into a standardized argument string to be passed to the appropriate executable or code entry point in the VPOS, as shown in function block **4990**. Thus, when a VPOS receives an incoming message from a Gateway and parses the Extended SET portion of the message, the message may cause VPOS to execute a program that takes action or queries the user to take action.

3. Gateway-initiated Messages

Since all SET messages between a merchant and an acquirer are currently merchant-initiated (as specified in the SET documentation), there must be a separate mechanism for initiating a message from a gateway, for example to request the upload of management information base (MIB) data, or to download new parameters. This is accomplished by requiring the gateway to send a message to the merchant via a MIME-encapsulated PKCS-7 conformant message containing name-value pairs to the merchant server directly, rather than to the SET module. This channel is shown in FIG. **18A** at block **1860**.

The message is verified for origination from the acquirer, and is utilized to either initialize a merchant action, such as to update the merchant's administration page (for example by blinking a message saying, "PLEASE RE-INITIALIZE YOUR TERMINAL"), or by initiating a request/response message pair originating from the merchant (for example, "HERE ARE THE CONTENTS OF MY MIB"). This is achieved by calling one of the extended terminal transaction interfaces (FIG. **18A** at **1834**), which in turn initiates a SET or Extended SET transaction.

Gateway Customization Via the Extended SET Channel

Gateway customization in extended SET is extremely powerful and a novel concept for VPOS processing. Each VPOS contains one or more "serial numbers" unique to each copy of the software (a serial number may be embedded in the software, or may be a component of a public key certificate used in the software). Once a merchant has selected an acquirer and obtained the appropriate certificates, the VPOS can be customized utilizing the communication link and messages containing customization applications.

A bank distributes VPOS via different sales channels. The first is direct from a bank to an existing merchant with whom the bank already has an existing relationship. In this case, a version of VPOS already customized for a bank is sent to the merchant, either directly by a bank, or through a third-party distributor or service bureau. The customizations may involve modification or replacement of, for example, a store front **1822**, shopping cart **1824**, pay page **1826**, standard terminal administration transaction interface **1828–1830** or an extended terminal transaction interface **1834**. This is a standard model of distribution of software that is customized for small target market segments.

The more interesting case, and the one that concerns the novel use of the Extended SET channel, is where the potential merchant acquires, through some non-bank channel, a "generic" VPOS which has not yet been customized to interact with a specific bank. This VPOS can communicate with a "test gateway", which the merchant may use to experiment with the various features of VPOS and to test the integration of the VPOS into a total online storefront.

In order to actually transact business over the Internet, the merchant must first obtain a merchant ID from the merchant bank with which he signs an acquiring agreement. For online payment processing, the merchant must also obtain an appropriate set of digital credentials in the form of public key certificates and possibly additional passwords, depending on the financial institution. Once these credentials are obtained, the merchant is ready to customize the already-obtained VPOS to communicate with a merchant bank's gateway.

Using the built-in "serial number" certificate and the Test Gateway public key certificate (which is "hard-wired" into the VPOS software), it is possible to securely download a particular bank's customization applications to a specific copy of the VPOS software. Once the VPOS is appropriately configured, the last stage of customization download is to configure the VPOS so that it only responds to a public key certificate of the merchant's acquirer. This process is illustrated here in the context of a merchant who obtains a VPOS that talks to the VeriFone test gateway, and desires to customize the VPOS to interact with a gateway at a bank.

The merchant has purchased a VPOS from a non-bank channel. The version communicates with the VeriFone Test Gateway. The merchant uses the gateway to learn about using VPOS, and to test the integration of his storefront system with his payment system. The merchant also obtains certificates for payment processing from a bank, the merchant bank of choice for the merchant. The merchant is now ready to customize VPOS to talk to the bank gateway. The flowchart for the merchant interaction with the Test Gateway is shown in FIG. **50**.

The merchant begins at function block **5000**, where the newly-obtained merchant SET certificates are installed in the VPOS. The merchant then directs the VPOS to connect to the VeriFone Test Gateway, by selecting this option from the VPOS terminal administration home page **5005**. The choice of this option invokes an extended terminal admin page from the default set of such pages supplied with the

generic version of VPOS. This program guides the customization process.

The merchant, interacting with the extended terminal admin page, navigates to the list of gateways which is maintained by the Test Gateway, and selects the bank to connect by selecting from the list of banks, at function block **5015**. During this process, the merchant's public key certificates are uploaded to the Test Gateway, and checked (at decision block **5025**) to verify that the certificates have been signed by the bank to customize the bank for the VPOS. If the certificates do not match, the merchant is advised of the situation in function block **5028**, and must select a different bank. If the certificates are not valid SET certificates as detected at decision block **5020**, the merchant is advised at function block **5010**, and the session terminates. If the certificates are valid and match the selected bank, customization continues at function block **5030**.

The extended terminal administration program in VPOS receives a list of the customizations from the Test Gateway that must be performed to specialize the VPOS for a specific bank. Some of these customizations are mandatory, while others are optional. In function block **5030**, the VPOS advises the merchant of the customizations, prompting for any choices that must be made by the merchant. The merchant's actions at this point drive decision block **5035**, in which the VPOS either returns itself to the "generic" state and terminates the interaction, or begins the configuration of the VPOS, depending on the merchant's confirmation of the request to begin the configuration.

If the merchant has authorized the changes, control is passed to function block **5040** where, the POS stores the certificates of any gateways that it will allow future configuration changes to be initiated from in its database. This may be only a specific bank, such as a bank and the Test Gateway, or other combinations. If only a single, non-Test, bank-owned, gateway is allowed to download changes, the VPOS is no longer customizable for any other bank. Then, a new copy would be purchased by the merchant to have it customized for another bank. If the Test Gateway is still allowed to customize the VPOS, the merchant could switch to another merchant bank and have the current VPOS updated to work with the new bank.

In function block **5050**, the customizations are downloaded to the VPOS. The downloads comprise a set of HTML pages and a set of executable programs or scripts that read data from the merchant, perform various functions, and present data to the merchant. In general, the customizations downloaded may augment or replace in part or in whole any and all of function blocks **1822**, **1824**, **1826**, **1828**, **1830**, or **1834** in FIG. **18**A. At a minimum, the terminal "home page" will be replaced so that it points to the new functionality. At this point, the customization of the VPOS has been completed, and the merchant may now begin sending payment requests to the merchant bank or processor through the VPOS.

Thread Safe VPOS—TID Allocation

Physical terminals process a single transaction at a time since clerks are usually only able to process one transaction at a time. Web Servers can process many transactions at a time, so payment requests can often occur simultaneously. Thus, the VPOS Software must have support for multitasking and provide support for multiple threads to be active at the same time in the same system as well as the same process. This requirement is relatively straight forward. However, the authorizing banks require that all transaction requests include a Terminal ID (TID), and, for many banks, no single TID may be active in any two transaction requests that overlap in time. Thus, the VPOS requires dynamic allocation of TIDs to requesting threads.

One way of providing for multiple TID's is to assign a "base" TID, and either an "extension" (a set of extra digits appended to the base), or an increment (a number which is added to the base to obtain the complete TID). While such a solution can be used for the majority of banks and processors, not all banks/processors can accommodate this solution. One example is First Data Corporation. For its ENVOY protocol, the terminal ID must use the Luhn check as recited in an ISO remark, which adds a checksum digit to the terminal ID to reduce chances of fraud or of mistyped information. Thus, to be general enough to handle all bank/processor situations, a pool of TID's is used. The TID's stored in the pool need not be a sequential set of numbers; in fact they can be alpha/special/numeric combinations, and the TID's need have no relation to one another. In a preferred embodiment, a TID is represented as a token in a pool that can be associated with a particular transaction.

To provide for this requirement, the VPOS provides a TID pool in tabular form in a database management system (DBMS). This table has two columns: TID NAME & Allocation date/time. If the TID date is null, then the TID is not in use and may be assigned. A date/time field is utilized to allow TID allocations to expire. TID requests are made utilizing a SQL query on the TID Pool to find the first null or expired date/time, which is replaced with the current date/time and the TID name returned.

REMOTE VPOS

The unique architecture of the Cardholder **120**, Merchant **130** and Gateway **140**, as shown in FIG. **1**B, provides communication capability between the modules utilizing the Internet to support linkages **150** and **170**. Since the Internet is so pervasive, and access is available from virtually any computer, utilizing the Internet as the communication backbone for connecting the cardholder, merchant and access to the authorizing bank through a gateway allows the merchant VPOS software to be remotely located from the merchant's premises. For example, the cardholder could pay for goods from any computer system attached to the Internet at any location in the world. Similarly, the merchant VPOS system could be located at a central host site where merchant VPOS systems for various merchants all resided on a single host with their separate access points to the Internet. The merchant could utilize any other computer attached to the Internet utilizing a SSL or SET protocol to query the remote VPOS system and obtain capture information, payment administration information, inventory control information, audit information and process customer satisfaction information. Thus, without having to incur the overhead of maintaining sufficient computer processing power to support the VPOS software, a merchant can obtain the information necessary to run a business smoothly and avoid hiring IS personnel to maintain the VPOS system.

VPOS Multi-Merchant Processing

Multiple merchant processing refers to the ability of a plurality of merchants to process their individual VPOS transactions securely on a single computer. The architecture relies on each payment page obtaining the merchant name in a hidden field on the payment page. The VPOS engine receives the merchant name with a particular transaction and

synchronizes the processing utilizing a Set Merchant method. This command causes the VPOS API to look up a unique registry tree based on the merchant name. This process causes the VPOS engine to engage the appropriate configuration to process the transaction at hand utilizing a Registry Tree. A registry tree contains Card Definition Tables (CDT)s, acquirer Definition Tables (ADT)s, Merchant Definition Tables (MDT)s, Protocol Configuration Tables (PCT)s, etc. The CDTs point to specific ADTs since each supported card can be supplied by a distinct acquirer. This is one form of split connection. Each of the ADTs in turn point to PCTs, and some acquirers can support multiple parallel gateways. A merchant's name refers to a unique database in the database management system which contains for example, TIDs.

So, for example, to fully qualify a particular merchant in a multi-merchant system, the acquirer Definition Table is queried to ascertain the particular Gateway (VFITest), then if Bank of America requires verification of network communication information, the particular CardDT is accessed with for example VISA. The particular merchant will service VISA transactions utilizing a particular acquirer. The particular piece of merchandise will also be detailed in a data base. Finally, the merchant Configurations will also be stored in the database to facilitate E-mail and name lookup.

VPOS CLIENT

The interaction between the VPOS and a client commences when a pay page solicits parameters of a transaction. Then, the parameters are validated to be sure the payment instrument, for example, cardnumber is not null. Then, a transaction object is created, eg. AUTHONLY, and the object is initialized and stuffed with parameters of the transaction, eg. ao.setpan(accnum), and the object is executed. This execution invokes the VPOS engine. The VPOS engine further validates the parameters based on the particular merchant's configuration. For example, some merchants do not accept American Express Cards, but will take Visa, and all merchants check the expiration date of the card. Assuming a valid and acceptable card has been tendered, then a TID is assigned (expiring, existing TIDs) or block a new TID from the TID Pool.

This generates a STAN, XID, RRPID unique tag and creates an initial record in the transaction database which is flagged as before gateway processing in case the transaction crashes and must be backed out. Then the protocol parameters are identified in the registry based on card type, and a particular acquirer identified. Then, a protocol object is created and executed to extract results from the protocol object and the before gateway "bit" is flipped to again flag the location of the transaction in the process as it is submitted to the Gateway.

The results received back from the Gateway are placed into a transaction object with is reported back to the pay page and ultimately back to the pay page user.

VPOS Merchant Pay Customization

A novel feature of the VPOS software provides payment page customization based on a merchant's preferences. This feature automatically lists cards that are accepted by a particular merchant based on the active terminal configuration. Each approved card for a particular merchant is linked to the display via an URL that provides a pointer to the credit card information supported by the merchant. Each card has an entry in a data structure referred to as the Card Definition Table (CDT).

A preferred embodiment of the VPOS merchant pay customization software in accordance with a preferred embodiment is provided in FIG. **19** which illustrates the logic utilizing a flowchart, and a listing of the source code below. Processing commences at terminal **1900** and immediately flows to function block **1910** where an index variable is initialized for stepping through each of the accepted payment instruments for the merchant's page. Then, at function block **1930**, a URL key is obtained associated with the current merchant pay page and index value. The URL key is a registry key name that points to a picture of a credit card that the merchant has associated with the pay page and which the merchant accepts as payment. At output block **1940** the card image associated with the URL key is obtained and displayed on the terminal. The CDT entry is obtained at function block **1950** utilizing the URL key. The CDT is utilized for storing information associated with each card. Then, at decision block **1960**, a test is performed to determine if the last payment method card has been processed and displayed on the merchant display. If not, then the index is incremented at function block **1920** and the loop reiterated to process the next card at function block **1930**. If all the cards have been processed, then control is returned to the merchant program for processing the transaction at terminal **1970**.

FIGS. **20A** through **20H** are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment. FIG. **20A** illustrates a prior art approach to POS processing utilized in most grocery stores and department stores today. POS Terminal **2001** accepts transactions provided to it one at a time by customers **2000**. For each transaction, POS Terminal **2001** builds a transaction request **2002** and transmits it to acquiring bank **2004** over communications link **2003**.

FIG. **20B** is a data structure **2002** representing a POS transaction request in accordance with a preferred embodiment. The data structure **2002** includes a TID field **2005**, which identifies the physical terminal from which the transaction originates. In addition to the TID field, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

FIG. **20C** illustrates a VPOS architecture with account requests being processed by a single acquiring bank. VPOS **2007** processes a plurality of customers **2000** concurrently. For each such customer **2000**, VPOS **2007** builds a data structure **2010**, representing the transaction to be performed for that customer. Each data structure **2010** contains a unique "virtual terminal" ID. VPOS **2007** selects a virtual terminal ID using database **2008**. For each data structure **2010**, VPOS **2007** initiates communication with acquiring bank **2004** using communication link **2003**.

FIG. **20D** is a data structure **2010** representing a VPOS transaction request in accordance with a preferred embodiment. The data structure **2010** includes a TID field **2012**, which identifies a virtual terminal ID associated with a particular transaction. In addition to the TID field **2012**, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

FIG. **20E** illustrates a TID allocation database **2008** in accordance with a preferred embodiment. Database **2008**

includes a TID allocation table **2011**. TID allocation table **2011** includes a plurality of rows, one for each TID used by each acquiring bank. One such row **2013** is illustrated in detail. Row **2013** includes a good/service order (GSO) identifier **2014**, which identifies the order being transmitted; a TID field **2015**, which identifies a terminal ID that may be used with a particular acquiring bank; and an acquiring bank field **2016**, which identifies the acquiring bank for which the TID is valid. In addition, row **2013** may optionally include other fields **2017** that may be used in conjunction with the order processing. A null GSO value indicates that the TID/acquirer combination is not currently in use.

FIGS. **20F** through **20H** are flowcharts of the detailed logic used to perform virtual terminal ID allocation. FIG. **20F** illustrates the main line operation of virtual TID allocation. In step **2020**, execution begins. In step **2021**, a skeletal transaction request structure is prepared. In step **2022**, the main line routine obtains a virtual TID for inclusion within the transaction request structure, as will be more fully disclosed with reference to FIG. **20G**, below. In step **2023**, the routine verifies that a TID was obtained. If the TID was not obtained, for example, if more transactions are currently being processed than there are TIDs, then execution continues to step **2024**. In step **2024**, the transaction request is put on a queue for future processing. In step **2025**, the routine waits for a transaction process to end, which would free up a TID in use. At that point, control resumes from step **2022**, and the routine again attempts to obtain a TID.

If the TID was successfully obtained in step **2023**, control proceeds to step **2026**. In step **2026**, the routine submits the transaction to the acquiring bank. In step **2027**, the transaction is processed. In step **2028**, the routine makes a database call to free up the TID that was used in the transaction. In step **2029**, transaction processing ends.

FIG. **20G** depicts in detail the process of obtaining a TID from the database. Execution begins in step **2040**. In step **2041**, the routine constructs a database call to reserve a TID for processing, for example, by constructing an SQL statement to retrieve a TID row from the database. In step **2042**, the routine executes the database call that was constructed in step **2041**. In step **2043**, the routine constructs a second database call to extract the TID from the row that was reserved in step **2042**. In step **2044**, the database call constructed in step **2043** is executed to obtain the TID. In step **2045**, a return code is checked to verify whether the TID was successfully obtained. If the TID was successfully obtained, control proceeds to step **2046**, which returns to the calling program. If, however the TID was not obtained, control proceeds to step **2047**. In step **2047**, the routine checks to see whether an excessive number of retries have already been attempted. If there have been an excessive number of retries, control proceeds to step **2048**, which exits with an error indication. If there has not been an excessive number of retries, control proceeds once again to step **2043** to retry the extraction operation.

FIG. **20H** depicts the operation of releasing a TID that had been used in a prior transaction. Execution begins in step **2060**. In step **2062**, the routine constructs a database call to update the row for the selected TID so that the value for the good and service order is null, thereby indicating that the selected TID is not associated with any good or service order, and is therefore free for reuse. In step **2064**, the routine executes the SQL statements constructed in step **2062**, thereby releasing the TID for use in future transactions. In step **2069**, the routine returns to the calling program.

A source code listing for the transaction request processing is provided below in accordance with a preferred embodiment.

```
#include "rr.h"
#ifndef_NT
#define_NT
extern void_setenvp( );
#endif
////////////////////////////////////////////////////////
// AcquireBillHtml
// On Pay page, output form entries to acquire billing information
////////////////////////////////////////////////////////
EStatus AquireBillHtml(CWSINT& clWSINT, int nTot, CProf& clProfile, EPCLCurrency
eCurrency) {
    //Current time
    time_t tNow; //figure out current year for Credit card expiry
    struct tm *tmNow;
    char szYear[DB_YEAR_SZ + 1];
    char szAmount[FORMATTED_CURRENCY + 1];
    time(&tNow);
    tmNow = localtime(&tNow);
    strftime(&szYear[0], (size_t)DB_YEAR_SZ + 1, "%Y", tmNow); //needs extra 1 for null
    int nYear = atoi(szYear);
/*<TH>Payment Type</TH>\n<TD><INPUT SIZE = 20 NAME=b_instrument VALUE=\""\
        << clProfile.m_b_instrument <<"\"></TD>" \
        <<"*/
    clWSINT << "<CENTER><TABLE BORDER=0><CAPTION ALIGN = TOP><B>Bill
To</B></CAPTION>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Account Number</TH><TD COLSPAN = 5><INPUT
SIZE = 56 MAXLENGTH = "
        << ACCT_NUM_SZ << " NAME=b_card> </TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Name on Card</TH><TD><INPUT SIZE = 20
MAXLENGTH=" << NAME_SZ
        <<" NAME=b_name VALUE=\"" << clProfile.m_b_name
        << "\"> </TD><TH>Expiration</TH><TD>Month <SELECT NAME =
b_expire_month><OPTION> 01\n <OPTION> 02\n" <<
        "<OPTION> 03\n <OPTION> 04\N<OPTION> 05\n<OPTION> 06\n<OPTION>
07\n<OPTION> 08\n<OPTION> 09\n" <<
```

-continued

```
        "<OPTION> 10\n<OPTION> 11\n<OPTION> 12\n</SELECT> Year <SELECT
NAME = b_expire_year><OPTION>" << nYear <<
        "<OPTION>" <<nYear + 1 << "<OPTION>" << nYEAR + 2 <<"<OPTION>" <<nYear
+ 3 << "<OPTION>" << nYear + 4 <<
        "</SELECT></TD></TR>\n";
    //<TH>Expires</TH><TD>Month <INPUT SIZE=3 NAME=b_expire_month> Year <INPUT
SIZE=5 NAME=b_expire_year></TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Address Line 1</TH><TD COLSPAN=5><INPUT
SIZE=56 MAXLENGTH= " << ADDR_SZ
        << " NAME=b_addr1 VALUE=\"" << clProfile.m_b_addr1 <<"\"> </TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Address Line 2</TH><TD COLSPAN=5><INPUT
SIZE=56 MAXLENGTH= " << ADDR_SZ
        << " NAME=b_addr2 VALUE=\"" <<clProfile.m_b_addr2 <<"\"> </TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>City</TH><TD><INPUT MAXLENGTH=" <<
CITY_SZ << " NAME=b_city VALUE=\""
        << clProfile.m_b_city << "\"> </TD>" << "<TH>State/Province</TH><TD><INPUT
MAXLENGTH=" << STATE_SZ
        << " NAME=b_state VALUE=\"" << clProfile.m_b_state << "\"> </TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Country</TH><TD><INPUT MAXLENGTH=" <<
COUNTRY_SZ
        <\" NAME=b_country VALUE=\"" << clProfile.m_b_country <<"\">
</TD><TH>Zip/Postal Code</TH><TD><INPUT MAXLENGTH="
        << ZIP_SZ << " NAME=b_zip VALUE=\"" << clProfile.m_b_zip <<"\">
</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Email</TH><TD><INPUT MAXLENGTH= " <<
EMAIL_SZ <<" NAME=b_email VALUE=\""
        << clProfile.m_b_email << "\"> </TD>"   << "<TH>Phone</TH><TD><INPUT
MAXLENGTH= " << BPHONE_NUM_SZ
        << " NAME=b_phone VALUE=\""   << clProfile.m_b_phone <<"\">
</TD></TR>\n";
    clWSINT << "</TABLE></CENTER><P>\n";
    //NPW<< " NAME=b_addr1> </TD>" << "<TH>Payment
Instrument</TH>\n<TD><SELECT NAME =b_instrument>";
    //hack from ini (bug) which pay instruments supported
    //NPW clWSINT << "<OPTION> Credit Card\n" << "<OPTION> Debit
Card\n</SELECT></TD></TR>\n";
    CurrFormat(nTot, eCurrency, szAmount);
    clWSINT << "<CENTER><FONT SIZE=5>Total = " << szAmount <<
"</FONT></CENTER>";
    return (eSuccess);
}
////////////////////////////////////////////////////
//PayButtonsHtml
// Output buttons on pay page: return to shop, pay, pay window,
// modify order
////////////////////////////////////////////////////
void PayButtonsHtml(CWSINT& clWSINT, char* pszShopUrl, CRRReg& clReg) {
    char *pszHomeUrl = clWSINT.LookUp("home_url");
    char *pszModifyUrl = clWSINT.LookUp("modify_url");
    char *pszSoftUrl = clWSINT.LookUp("soft_url");
    if (!pszHomeUrl) pszHomeUrl = pszShopUrl; //Home page
    //if (!pszModifyUrl) pszModifyUrl = pszShopUrl; //Shopping Cart typically
    clWSINT << "<CENTER><H4>By pressing the Pay! button I agree to pay the above total
amount<br> according to the card issuer agreement<H4></CENTER>\n";
    clWSINT << "<CENTER>\n<A HREF = " << pszShopUrl << "> <IMG SRC=" <<
clReg.m_szReturnShop << " BORDER = 0></A>\n";
#ifdef_SC
    clWSINT << "<INPUT TYPE = IMAGE NAME = gso SRC = " << clReg.m_szModifyOrder <<
" BORDER = 0>\n";
#else
    if (pszModifyUrl)
        clWSINT << "<A HREF = " << pszModifyUrl << "> <IMG SRC=" <<
clReg.m_szModifyOrder << " BORDER = 0></A>\n";
#endif
    clWSINT << "<INPUT TYPE = HIDDEN.NAME = home_url VALUE = " << pszHomeUrl <<
">\n"
    << "<INPUT TYPE = IMAGE NAME = VPOS SRC = " << clReg.m_szPay << " BORDER =
0>\n"
    << "<INPUT TYPE = HIDDEN NAME = shop_url Value = " << pszShopUrl << ">\n"
    << "<INPUT TYPE = HIDDEN NAME = store VALUE = " << clWSINT.LookUp("store") <<
">\n"; //Can't be NULL or error previously
    if (pszSoftUrl)
        clWSINT << "<INPUT TYPE = HIDDEN NAME = soft_url VALUE = " << pszSoftUrl
<< ">\n";
    clWSINT << "</CENTER>\n";
}
////////////////////////////////////////////////////
// DisplayPayPage
// Outputs billing form, buttons, and static gso
////////////////////////////////////////////////////
```

-continued

```
EStatus DisplayPayPage(CWSINT& clWSINT, CRRReg& clReg, int nError) {
    EStatus eStat;
    char szFileLine[BUFFER_SZ + 1];
    char *pszTag, *pszRefererUrl, *pszShopUrl, *pszExePath, *pszServerName;
    time_t tNow;
    int nTagExist = FALSE;
    HKEY hCardsKey; //To enumerate cards
    long retCode;
    int nNoCards;
    DWORD dwtype, dwlen;
    HKEY hCardKey;
    char szCardBuf[MAX_PATH + 1], szCardPic[MAX_PATH + 1];
#ifdef_SC
    CPOLBk clBkGso;
#else
    char *pszTxn, *pszGsoNum, *pszGsoOpaque, *pszTot;
#endif
    //Shipping headers. If come from gso page and cookies are not set, set.
    CProf *pProfile;
    pProfile = new CProf( );
    if (!pProfile) return (eRRNewFailed);
    eStat = pProfile->Init(clSWINT);
    if (eStat != eSuccess) return (eStat); //Init failed
#ifdef_SC /*No session cookie for the pay page. This means the user will either use a long
        term cookie or type in their info each time*/
    clWSINT << "Set-Cookie: profile=" << pProfile->GetCookieLine( ) << "; path=/\n";
/*  if(clWSINT.LookUp("Server Name"))
        clSWINT << "; domain = "<< clWSINT.LookUp("Server Name") << ";\n";*/
#endif
#ifdef_SC
    //Shipping filled in?
    if (!(pProfile->m_s_name[0] && pProfile->m_s_addr1[0] &&pProfile->m_s_city[0] &&
pProfile->m_s_state[0] &&
        pProfile->m_s_zip[0] && pProfile->m_s_country[0] && pProfile->m_s_ship[0]) {
        eStat = DisplayGsoPage(clWSINT, clReg, ERROR_DISPLAY); //bug, return
correct?
        return eStat;
    }
    //Creates shopping basket from CGI/Cookies
    eStat = clBkGso.Init(clWSINT, *pProfile, clReg);
    if (eStat != eSuccess) return (eStat); //eRRBasketCreateError
    //Cookies then other headers
    clBkGso.ToCookies(clWSINT, REGULAR);
#endif
//clWSINT << "Pragma: no-cache\n";
clWSINT << "Content-type: test/html\n\n";
//Where to position the page. if all information is filled in, here.
if (!nError) {clWSINT << "<A name=jump></A>";}
//Output HTML
ifstream ifPay;
ifPay.open(clReg.m_szPayTemplate, ios::in|ios::nocreate);
if (ifPay.fail( )) return (eRRCantOpenPayTemplate); //couldn't read pay template file
//HTML Template
while (ifPay) {
    ifPay.getline(szFileLine, BUFFER_SZ);
    if (!(pszTag = strstr(szFileLine, DYNAMIC_TAG)))
        clWSINT << szFileLine << "\n";
    else {
        nTagExist = TRUE;
        //Null the tag, Output the beginning of the line,
        //make the dynamic basket call, output the rest of the line
        if (strlen(szFileLine) == strlen(DYNAMIC_TAG))
            pszTag[0] = NULL;
        else {
            pszTag[0] = (char) NULL;
            pszTag += strlen(DYNAMIC_TAG) + 1; //was 9
        }
        clwsint << szFileLine;
        //Dynamic call
        pszRefererUrl = clWSINT.LookUp("Referer");
        if (!pszRefererUrl) return (eRRNoRefererUrl);
        pszExePath = clWSINT.LookUp("Executable Path");
        if (!pszExePath) return (eRRNoExePath);
        pszServerName = clSWINT.LookUp("Server Name");
        if (!pszServerName) return (eRRNoServerName);
        clWSINT << "<FORM METHOD = POST ACTION = http";
        if (clReg.m_nUseSSL)
            clWSINT << "s";
        clWSINT << "://" << pszServerName << pszExePath << "#jump>";
        /*clWSINT << "<FORM METHOD = POST ACTION = " << pszExePath <<
```

-continued

```
"#jump>";*/
        //Setting Long Cookies
        clSWINT << "<CENTER>If you wish to have billing and shipping defaults
set in your browser, check this box "
            << "<INPUT TYPE = CHECKBOX
NAME=long_cookies></CENTER>\n";
        //Fill it in message
        if (nError) {
            clWSINT << "<A NAME=jump></A>";
            clWSINT << "<CENTER><H4>You must fill in <I>all</I> of the
billing information except for <I>address line 2</I> and <I>email</I> </H4></CENTER>";
        }
        //GsoNum
#ifdef_SC
        time(&tNow); //For multithreading, append instantiation number
        clWSINT << "<TABLE ALIGN=RIGHT><TR><TH>Order
Number</TH><TD>" << tNow
            << "</TD></TR></TABLE><BR CLEAR=ALL>\n<INPUT
TYPE=HIDDEN NAME=b_gso_num VALUE = " << tNow << ">\n";
#else
        //Pay page API: transaction type, GSO #, gso opaque
        pszGsoNum = clWSINT.LookUp("b_gso_num");
        if (pszGsoNum)
            clWSINT << "<TABLE ALIGN=RIGHT><TR><TH>Order
Number</TH><TD>" << pszGsoNum
            << "</TD></TR></TABLE><BR CLEAR=ALL>\n<INPUT
TYPE=HIDDEN NAME=b_gso_num VALUE = " << pszGsoNum << ">\n";
        else {
            time(&tNow); //For multithreading, append instantiation number
            clWSINT << "<TABLE ALIGN=RIGHT><TR><TH>Order
Number</TH><TD>" << tNow
            << "</TD></TR></TABLE><BR CLEAR=ALL>\n<INPUT
TYPE=HIDDEN NAME=b_gso_num VALUE = " << tNow << ">\n";
        }
        //Some pay page only specifics: transaction to execute, gso opaque
        pszTxn = clWSINT.LookUp("transaction");
        if (pszTxn)
            clWSINT << "<INPUT TYPE=HIDDEN NAME=transaction VALUE =
" << pszTxn << ">\n";
        pszGsoOpaque = clWSINT.LookUp("gso_opaque");
        if (pszGsoOpaque)
            clWSINT << "<INPUT TYPE=HIDDEN NAME=gso_opaque VALUE =
\"" <\ pszGsoOpaque << "\">\n";
#endif
#ifdef_SC
        //Bill to information & Payment Instrument
        eStat = AcquireBillHtml(clWSINT, clBkGso.GetTot( ), "pProfile,
(EPCLCurrency) clReg.m_eDefaultCurrency);
#else
        //Pay Page alone requires a total
        pszTot = clWSINT.LookUp("total");
        if (!pszTot) return (eRRNoPayTotal);
        eStat = AcquireBillHtml(clWSINT, atoi(pszTot), "pProfile, (EPCLCurrency)
clReg.m_eDefaultCurrency);
        clWSINT << "<INPUT TYPE=HIDDEN NAME=total VALUE = " << pszTot <<
">\n";
#endif
        if (eStat != eSuccess) return (eStat); //error from db? within
AcquireBillHtml
        clWSINT << "<P>\n";
        //Output Buttons on Form
        pszShopUrl = clWSINT.LookUp("shop_url");
        if (!pszShopUrl)
            PayButtonsHtml(clWSINT, pszRefererUrl, clReg);
        else
            PayButtonsHtml(clWSINT, pszShopUrl, clReg);
        //Registry Card LookUp
        clWSINT << "<CENTER><TABLE CELLSPACING = 5><TR><TH>Cards
Accepted:</TH>";
        RegOpenKeyEx(clReg.m_hStoreKey, "API\\CDT", 0, KEY_READ,
&hCardskey);
        dwlen = sizeof(int);
        RegQueryValueEx(hCardsKey, "NoOfRows", 0, &dwtype,
(LPBYTE)&nNoCards, &dwlen);
        for (int i = 0; i < nNoCards; i++) {
            RegEnumKey(hCardsKey, i, szCardBuf, MAX_PATH + 1);
            RegOpenKeyEx(hCardsKey, szCardBuf, 0, KEY_READ,
&hCardKey);
            dwlen = MAX_PATH + 1;
            retCode = RegQueryValueEx(hCardKey, "CardPicture", 0,
```

-continued

```
&dwtype, (LPBYTE)szCardPic, &dwlen);
            if (retCode != ERROR_SUCCESS) return eRRRegistryFailure;
            clWSINT << "<TD><IMG SRC = " << szCardPic << "></TD>";
                RegCloseKey(hCardKey);
            }
            RegCloseKey(hCardsKey);
            clWSINT << "</TR></TABLE></CENTER>";
            clWSINT << "</FORM>\n<HR>\n";
#ifdef_SC
            //Output static HTML Table
            clBkGso.ToHtml(clWSINT, NOEDIT);
            //Output static Shipping information
            StaticShipHtml(clWSINT, *pProfile); //Also NO_EDIT
            clWSINT << "<HR>\n";
#else
            //Pay page alone takes and passes through a gso
            if (pszGsoOpaque)
                clWSINT << pszGsoOpaque << "\n";
#endif
            //Rest of Line from template file
            if (pszTag)   clWSINT << pszTag;
        }
    }
    if (nTagExist != TRUE)
        return(eRRNoDynamicTag);
    else
        return (eSuccess);
}
////////////////////////////
//Receipt Page
//////////////////////////////////////////////////////////////////////
//////////////#ifdef_SC
//////////////////////////////////////////////////////
// StaticShipHtml
// On Pay page, output Static table of shipping information
// based on cookies set in prior page
//////////////////////////////////////////////////////
void StaticShipHtml(CWSINT& clWSINT, CProf clProfile) {
    clWSINT << "<CENTER><TABLE CELLSPACING=10><CAPTION ALIGN = TOP><B>Ship
To<B></CAPTION>\n";
    clWSINT << "<TR>\TH ALIGN=LEFT>Name</TH><TD>" << clProfile.m_s_name <<
"</TD>" <<
        "<TH ALIGN=LEFT>Address Line 1</TH><TD>" << clProfile.m_s_addr1 <<
"</TD></TR>\n";
    clWSINT << "<TR><TH ALIGN=LEFT>Address Line 2</TH><TD>" << clProfile.m_s_addr2
<< "</TD>" <<
        "<TH ALIGN=LEFT>City</TH><TD> << clProfile.m_s_city << "</TD></TR>\n";
    clWSINT << "<TR><TH ALIGN=LEFT>State/Province</TH><TD>" << clProfile.m_s_state
<< "</TD>" <<
        "<TH ALIGN=LEFT>Zip/Postal Code</TH><TD>" << clProfile.m_s_zip <<
"</TD></TR>\n";
    clWSINT << "<TR><TH ALIGN=LEFT>County</TH><TD>" << clProfile.m_s_country <<
"</TD>" <<
        "<TH ALIGN=LEFT>Shipping Method</TH><TD>" << clProfile.m_s_ship <<
"</TD></TR>\n";
    clSWINT << "</TABLE></CENTER><P>";
}
#endif
//////////////////////////////////////////////////////
// StaticBillHtml
// On Receipt page, output static table of billing information
//////////////////////////////////////////////////////
void StaticBillHtml(CWSINT& clWSINT, CProf clProfile) {
    /*<TH>Payment Type</TH>\n<TD>" << clProfile.m_b_instrument
        << "</TD>*/
    clWSINT << "<CENTER><TABLE CELLSPACING=10><CAPTION ALIGN = TOP><B>Bill
To<B></CAPTION>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Account Number</TH><TD COLSPAN=3>" <<
clProfile.m_b_card << "</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Name on Card</TH><TD>" << clProfile.m_b_name
<<
        "</TD><TD><B>Expires:</B><I>Month</I>" << clProfile.m_b_expire_month <<
" <I>Year</I> " << clProfile.m_b_expire_year << "</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Address Line 1</TH><TD COLSPAN=3>" <<
clProfile.m_b_addr1 << "</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Address Line 2</TH><TD COLSPAN=3>" <<
clProfile.m_b_addr2 << "</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>City</TH><TD>" << clProfile.m_b_city << "</TD>"
        << "<TH>State/Province</TH><TD>" << clProfile.m_b_state << "</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Country</TH><TD>" << clProfile.m_b_country <<
```

-continued

```
        "</TD><TH>Zip/Postal Code</TH><TD>" << clProfile.m_b_zip <<
"</TD></TR>\n";
    clWSINT << "<TR ALIGN=LEFT><TH>Email</TH><TD>" << clProfile.m_b_email <<
"</TD>"
        << "<TH>Phone</TH><TD>" << clProfile.m_b_phone << "</TD></TR>\n";
    clWSINT << "</TABLE>\CENTER><P>\N";
}
```

Default Gateway Configuration

The VPOS is initially shipped enabled to connect to a default gateway with a single instance of a gateway defined that accesses a predefined site for testing of an installation before bringing it online in a production mode. The test installation contacts and converses with an actual gateway that simulates live transactions. After the installation checks out utilizing a set of test transactions, the test gateway downloads the pre-checked customizations to the installation so that it can switch over to the production acquirer.

This download processing is enabled in extensions to SET.

Internet Transaction Gateway

Payment methods that issue cards for conducting business utilize four major entities. These entities are the issuer, consumer, merchant and the acquirer. The issuing bank that provides the consumer with a credit card are usually not the same bank as the acquiring bank that serves the merchant. When the consumer utilizes a credit card to pay for a purchase, the merchant swipes the card through the POS terminal which makes a connection to the merchant's acquirer via the telephone network and transmits an authorization request with data read from the magnetic stripe. The acquirer's host processor, depending on the card number, will either perform local processing or switch the request to the correct issuing bank's host processor through the interchange network. In a few seconds, the authorization response is returned to the originating POS indicating either an approval or a rejection.

The Internet is a viable infrastructure for electronic commerce. Ubiquitous browser software for the World Wide Web provides around-the-clock access to a large base of information content provided by Web servers. Utilizing a preferred embodiment, consumers using browsers can shop at virtual stores and malls presented as Web pages managed by the merchants' servers. Consumers can make purchases and pay for them using credit cards or other digital payment instruments in a secure manner. For such Internet-based payments to be authorized, a "gateway" is necessary at the back end to channel transactions to legacy processors and interchange networks.

FIG. **21** is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment. Processing commences when a TCP transaction **2100** is received by a HTTPS Server **2102** and parsed to an appropriate Web Adaptor **2104** which posts an encrypted set transaction to the multithreaded gateway engine **2110**. The encrypted SET request is received at a decryptor **2120**, decrypted into a standard SET transaction and authenticated for converting by the forward converter **2124**. Inside the forward converter **2124**, decides if the request is an original request, and honest retry attempt or a replay attack. The converted transaction is passed to the socket multiplexor **2130** to communicate via an existing communication link **2140** to a host computer. A security logger **2150** is also utilized for passing security records back via a database server **2160** to a database administration application **2190**. A transaction logger **2155** also utilizes the database server **2160** to capture transaction logs in a database **2180**. Other system administration tasks **2195** include a web server administration task **2190** which logs web hits in a log **2170**.

FIG. **22** is a flow diagram in accordance with a preferred embodiment. Processing flows from customers **2200** that are paying for products over the Internet or other communication medium utilizing HTTPS or other protocols to one or more merchants **2210**, **2220** or **2230** to a gateway **2240** which directs transactions to a particular host processor **2250** for authorization processing in accordance with the present invention.

Internet Payment Authorization

The Gateway is a secure computer system that mediates transactions between the merchants' servers and a payment processor. The Gateway supports secure communications between merchants using the Internet on one side, and a processor using standard secure financial networks on the other side. Between the two interfaces, the Gateway maintains a detailed log of all transactions, whether in-progress, completed, or failed. The Gateway accepts transactions from merchants and converts them into legacy compatible formats before forwarding them to the host processor. Responses from the host, after the reverse conversions, will be returned to the originating merchants.

The Gateway performs many functions, including:

- Receives encrypted credit card transactions from the merchants via the Internet
- Unwraps and decrypts transactions
- Authenticates digital signatures of transactions based on certificates
- Supports all transaction types and card types
- Accepts concurrent transactions from each of the merchant servers
- Converts transaction data to legacy formats; forwards the mapped requests (in the clear) to a payment processor over existing communication links
- Converts transaction responses, correlates them with the original requests, and sends the mapped responses back to the merchants
- Provides logging, monitoring, reporting, and system administration

FIG. **23** illustrates a Gateway's **2330** role in a network in accordance with a preferred embodiment. The Gateway **2330** strictly conforms to all SET stipulations regarding certificate management, PKCS signed data encapsulation, PKCS encrypted data encapsulation, ASN. 1 representation, DER encoding, MIME encapsulation, and message sequencing. A merchant server **2300** communicates via the Internet **2310** using the SET protocol **2320** through a gateway server **2330** using a network interface processor **2340** to communicate to a legacy network **2360** in, for example the X.25

protocol **2350**. The legacy host **2370** ultimately receives and processes the transaction from the merchant server **2300** without modification to its code.

Internet Communication Protocols

As discussed above, the TCP/IP protocol suite is utilized at the transport level. At the application level, in compliance with SET, all requests arrive at the Gateway in MIME encapsulated HTTP format. Similarly, all responses from the Gateway to the merchant servers will be transferred in HTTP. The HTTP protocol stipulates that a request-response pair will go through the same TCP connection and that the originator, in this case a merchant server, will establish a connection to send the request and will take down the connection when it has received the response.

Host Payment Protocols

Message conversions performed by the Gateway will be significantly more than format transliterations: per-protocol differences in data elements and message semantics must be considered carefully. Some of the transaction types that are supported are listed below.

Transaction Types
Credit card sale with capture
Credit card sale without capture
Credit card sale with capture including AVS (MasterCard and VISA)
Credit card sale without capture including AVS (MasterCard and VISA)
Credit card return (Credit)
Credit card post authorization (Force Post)
Credit card post authorization (Force Post) with partial reversal support, enhanced authorization data, and AVS result code (VISA)
Credit card sale with capture - Void
Credit card return (Credit) - Void
Totals request (for balancing)

Host Communications Protocols

A virtual, private network between the Gateway and the host processor is established to expedite host communication. In addition, two Network Interface Processors (NIP) s—a "near end" NIP that interfaces to the Gateway and a "far end" NIP that interfaces to the host. The NIPs will handle virtual connections between themselves. The far-end NIP will take care of specific communication details. The near-end NIP is an IP-addressable device that converts between TCP messages and packets. It is installed on a public network **2330**, which is a LAN outside the corporate firewall. The Gateway, on the secure public network **2330**, utilizes TCP/IP **2320** to communicate with the near-end NIP.

GATEWAY FEATURES

Because the Gateway must sustain reliable operations and enable graceful evolution, it is designed with some important attributes, including: Security, Availability, Performance, Scalability, and Manageability.

Security

Channel Security

At the application level, SET provides signed and encrypted data encapsulations of payment information portions of the transaction messages. Transport-level encryption of the entire message packet is required for additional security. The HTTPS protocol—i.e., HTTP over SSL 3.0—is utilized between the merchants and the Gateway. The virtual connections between the near-end NIP and the host are part of a private network. The termination will occur outside the firewall. Data between the Gateway and the host is sent in the clear with no encryption. In this network configuration, a transaction between a merchant's VPOS and the host will cross the firewall four times: SET request from VPOS to Gateway, legacy request from Gateway to NIP, LEGACY response from NIP back to Gateway, and SET response from Gateway back to VPOS.

Certificate Management

Payment Protocol Certificates

The Gateway uses certificates to authenticate the two parties involved in each MOSET transaction. Through a Certificate Authority, one certificate is issued for the Gateway and one certificate for each of the merchant servers.

Secure Channel Certificates

SSL will require separate certificates for the Gateway and the merchants.

Availability

Site redundancy and location redundancy allows the Gateway to sustain service through virtually instantaneous recovery from internal failures or external disasters that cause physical damages to the system. Minimum-outage recovery is possible with redundant configurations of important components.

Site Redundancy

The Gateway supports connections to a proprietary bank network and supports mirrored disk arrays.

Location Redundancy

The Gateway architecture supports location redundancy where a secondary remote system is connected to the primary system via dedicated WAN links for software-driven database duplication.

Scalability

The Gateway software architecture, the choice of third-party software components, and the selection of hardware platforms enable the system to gracefully adapt and evolve to take on new demands in different dimensions.

The Gateway resides on an HP 9000 that is housed in a standard 19" EIA rack.

Gateway Hardware Configuration

Server Hardware Description
K-Class SMP Server - Model K420 - Standard Configuration
120 MHz PA-RISC 7200 CPU
128 MB ECC RAM
Built-in I/O includes Fast/Wide/Differential SCSI-2, EtherTwist 802.3 LAN, AUI, RS-232C Connectors, Centronics Parallel Port, and Internal Modem
650 MB CD-ROM Drive
HP-UX 10.10 Operating System (with two-user license)
4 HP-PB Slots
Additions
1 SCSI-2 Disk Controller to support disk mirroring ouer dual SCSI-2 buses
1 2 GB Internal SCSI-2 Disk Drive, 20MB/s transfer rate, not mirrored for systems software and swap space
1 4 GB External High-Availability Disk Arrays for databases - total of 4 x 2 MB modules required
1 4 GB DAT drive with data compression
1 HP-PB Slot Expansion Option provides 4 additional HP-PB slots for peripheral controllers
2 FDDI interface cards (each card uses 2 HP-PB slots)
1 Option for eight-user license for HP-UX

Cryptographic Hardware

The encryption and decryption algorithms used in processing SET/SSL messages require significant computational power. A "security processor" is deployed with the

Gateway to boost the performance of cryptographic algorithms. The processor is a networked peripheral device to the HP 9000 server. It provides cryptographic services suitable for SET/SSL processing, and its services are accessible via calls to software libraries running on HP-UX. FIG. **24** is a block diagram of the Gateway in accordance with a preferred embodiment.

Gateway Architecture

Operating System Software

The Gateway runs under the HP-UX Version 10.10 operating system and is upgraded to support future significant system releases. HP-UX 10.10 conforms to major standards, including:

- X/Open UNIX 95 (conforming with the Single UNIX Specification, SPEC 1170)
- X/Open Portability Guide Issue 4 Base Profile (XPG4) OSF AES
- IEEE POSIX 1003.1 and 1003.2
- AT&T System V Interface Definition (SVID3 base and kernel extensions subset) Level 1 API support
- UC Berkeley Software Distribution 4.3 (BSD 4.3) including such features as job control, fast file system, symbolic links, long file names, and the C shell
- System V.4 File System Directory Layout

This compliance with various software standards assures that while a preferred embodiment of the invention is disclosed in association with a best mode of practicing the invention other similar software and hardware environments can be readily substituted without undue experimentation.

Relational Database Management System (RDBMS) Software

The Gateway uses Oracle7 Server version 7.3 as the RDMBS and will be upgraded to use future significant system releases. The multi-threaded, multi-server architecture of Oracle7 provides applications with scalability to high-volume transaction workloads. When deployed with the HP 9000 K-Class platform, Oracle7 performs a symmetrically parallel database operation across all available processors. In addition, Oracle7 includes options for creating high-availability systems:

- The Oracle7 Parallel Server option extends the reliability of applications by transparently harnessing the power of clustered computers in a single logical processing complex that can tolerate individual machine failures.
- Oracle7 Symmetric Replication provides high data availability. Data can be replicated from the primary system to one or more alternative sites.

HTTP Server

The Gateway utilizes Netscape's Enterprise Server 2.0 as the HTTP server. The server is designed for large-scale Internet commerce deployment, Enterprise Server 2.0 achieves performance and reliability with such features as optimized caching, SMP support, enhanced memory management, and SNMP-based performance monitoring. Efficient process management features minimize system load and increase server reliability. Security features are provided using the SSL 3.0 protocol.

Protocol Stacks

Internet and LAN—The TCP/IP protocol stack will be provided as part of the HP-UX operating system.

Other Application-Level Protocols

Application-level protocols enable client-server interoperability. Each of the following protocols are transported using TCP or UDP.

- HTML. HTML will be used to define screens for Gateway system administration.
- HTTP. The HTTP layer is part of Enterprise Server 2.0. The server is administered with a Web browser.
- SQL*Net. The Gateway's Oracle7 database can be accessed by administration clients using SQL*Net. Administration software can establish database connectivity to retrieve data for generating transaction reports.
- SNMP. Enterprise Server 2.0 can be monitored using SNMP. The Gateway utilizes SNMP for remote system management.

Transaction Performance Monitoring and Measurement

- The "hits" performance indicators are available from the Web server. Statistics can be generated at any time to highlight the load pattern or to pinpoint the time when the server was most active.
- Gateway statistics about transaction requests (by transaction type) and transaction results (e.g., success, failed due to host, failed due to authentication, etc.) can be determined at any time for a particular time interval by generating a report.

The Gateway is upgradeable to interoperate with a real-time event monitoring system such as OpenVision's Performance Manager.

TokenOpaque Contents

The Gateway requires information captured at the time of an AuthReq that must be repeated to the host at the time of the associated CapReq. The mechanism of choice (built into SET) for this is enabled utilizing this data in the TokenOpaque token of the CapToken which is sent in an AuthRes. This CapToken is stored at the Merchant system and represented to the Gateway at the time of the CapReq. The format of an TokenOpaque is an OctetString. The following general format (not specific to LEGACY) is proposed for capturing this information:

Field Name	Field Data Type	Explanation/Example
VersionName	char(8)	e.g. "LEGACY"
VersionRevision	char(8)	e.g. "1.0" (generally <major, minor>)
PILength	integer	length of PI data
PI	unsigned char(PILength)	strongly encrypted
HostspecDataLength	integer	length of host specific data
HostSpecData	unsigned char(HostSpecDataLength)	host specific data

Host Specific Data (LEGACY-only)

For "LEGACY" version "1.0", it is proposed that newline separated "name[length]=value" pairs be used to store the host specific data. A null character will terminate the host specific data. The following host specific data (name value pairs) will need to be included:

- BrandID
- CPSACIFlag
- CPSTransactionId
- CPSValidationCode
- VisaResponseCode
- MerchantCategoryCode
- EntryMode

NOTE: PI contains PAN and ExpiryDate.

Certificate Processing

Merchants require a mechanism for verifying legitimate cardholders is of valid, branded bankcard account numbers.

A preferred embodiment utilizes technology to link a cardholder to a specific bankcard account number and reduce the incidence of fraud and thereby the overall cost of payment processing. Processing includes a mechanism that allows cardholder confirmation that a merchant has a relationship with a financial institution allowing it to accept bankcard payments. Cardholders must also be provided with a way to identify merchants they can securely conduct electronic commerce. Merchant authentication is ensured by the use of digital signatures and merchant certificates.

In a preferred embodiment, a holder of a payment instrument (cardholder) surfs the web (Internet) for required items. This is typically accomplished by using a browser to view on-line catalog information on the merchant's World Wide Web page. However, order numbers can be selected from paper catalogs or a CD-ROM and entered manually into the system.

This method allows a cardholder to select the items to be purchased either automatically or manually. Then, the cardholder is presented with an order form containing the list of items, their prices, and totals. The totals could include shipping, handling and taxes for example. The order form is delivered electronically from the merchant's server or created on the cardholder's computer by electronic shopping software. An alternative embodiment supports a negotiation for goods by presenting frequent shopper identification and information about a competitor's prices.

Once the price of goods sold and the means of payment has been selected, the merchant submits a completed order and the means for payment. The order and payment instructions are digitally signed by cardholders who possess certificates. The merchant then requests payment authorization from the cardholder's financial institution. Then, the merchant sends confirmation of the order, and eventually ships the goods or performs the requested services from the order. The merchant also requests payment from the cardholder's financial institution.

FIG. **1C** is a block diagram of a payment processing system in accordance with a preferred embodiment. The Certificate Issuance at the Bank Web Site **162** resides at the bank web site **182**. It is utilized for issuing SET complaint/X.500 certificates to consumers. The implementation of this system may vary from one bank to another. However, the system gathers consumer's personal information, and after processing the information, the system issues a certificate along with a payment instrument to the consumer.

The Single Account Wallet **160** at the bank web site **182** represents the MIME message that is created by the Certificate Issuance system. This MIME message contains a VeriFone wallet. The VeriFone wallet contains a single payment instrument and the certificate associated with it. For security reasons, the private key is not included in the wallet. The has to specify a private key before using the instrument for payment. When the consumer is issued the certificate, this MIME message is sent to the browser. The browser launches the Certificate Installation application **174**, **144** which is defined as a helper application in the browser. The Certificate Installation application **174**, **144** reads the MIME message and install the wallet into the wallet database **158**.

Various helper applications **188**, **172**, **174**, **176** are provided to make the consumer's shopping experience easy and efficient including the following helper applications. The Paywindow helper application **188** is utilized by the consumer to authorize the payment to the merchant, to administer their wallets, to review their previously completed payment transactions and to perform housekeeping activities on the wallets. This application is defined as a 'helper' application on the consumer's desktop. The browser launches this application when the merchant system sends a MIME message requesting payment.

The PayWindow Setup Helper application **172** is used by the consumer to install helper applications and other modules from the web site onto the consumer desktop. When a consumer attempts to install an application for a first time, the consumer does not have a helper application on the desktop. Thus, the first time installation of an application requires a consumer to perform two steps. First the user must download the system package to their desktop and then the user must run setup to decompress and install the system. Thereafter, whenever the consumer gets a new release of system software, the browser launches this helper application which in turn installs the appropriate other system modules.

The Certificate Installation Helper Application **174** is utilized to install a wallet that is issued by a bank. When the bank's certificate issuance web system sends the MIME message containing the VeriFone wallet, the browser launches this application. This application queries a consumer to determine if the payment instrument contained in the wallet is to be copied to an existing wallet or to be kept in the new wallet. This application then installs the payment instrument and the certificate into the wallet database **158**.

The Certificate Issuance CGI scripts **162** and the Single Account Wallet **160** at the Bank Web Site **182** is processed as described in the native system. The Certificate Installation Applet of the Bank Web Site **182** is utilized by the Certificate Issuance CGI scripts **162** system to deliver a consumer's certificate to the consumer's desktop.

FIG. **26** is an architecture block diagram in accordance with a preferred embodiment of the subject invention. Processing commences at function block **2600** where the Graphical User Interface (GUI) part of the application is initialized. The GUI application **2600** provides the consumer with support for ordering and making payments during the shopping process. There are also GUI components provided for wallet creation; importing, certificate and payment method creation and maintenance; and for transaction register review and reporting. The screen designs, and their associated logic, for the helper applications and applets are individually discussed in detail below.

The Certificate Manager **2604** manages the automatic downloading of a consumer's certificate from a bank, validation of a consumer's and a merchant's certificates and automatic requisition of certificate renewal.

The Payment Manager **2606** coordinates and completes the payment request that is received from the merchant system. The payment request is received via a MIME message in the native code implementation or via an applet in the Java implementation. The payment request received contains the final GSO, Ship-To name, merchant certificate, merchant URL, coupons and the payment amount. The Payment Manager **2606** then communicates with the payment related GUI component to interact with the consumer to authorize and complete the payment transaction. The Payment Manager **2606** is also responsible for determining the payment protocol based on the consumer's payment instrument and the merchant's preferred payment protocol.

The Payment Manager **2606** includes a well defined Application Programming Interface (API) which enables OEMs to interface with the Payment Manager **2606** to make payments to specific HTTP sites. The detailed logic associated with the Payment Manager **2606** is presented in FIG. **27**.

The Payment Manager **2606** enforces standard operations in the payment process. For example the receipt and the transaction record can automatically be transferred to the Wallet file once the payment is completed. The payment manager architecture in accordance with a preferred embodiment is presented in FIG. **27**. A user interfaces with the payment manager **2730** via a user interface **2700** that responds to and sends a variety of transactions **2710**, **2708**, **2706**, **2704** and **2702**. The transactions include obtaining the next record, payment record, receipt, acceptance of the payment instrument and GSO components. In turn, the payment manager **2730** sends transactions **2714** and receipts **2720** to the wallet manager **2722** and receives payment instruments, certificates and private keys from the wallet manager **2722**.

The payment manager **2730** also sends and receives transactions to the protocol manager **2770** including a merchant's payment message **2760**, a consumer certificate and PK handle **2750**, a merchant URL **2742**, a payment **2740**, a signed receipt **2734** and a GSO, Selected Payment Protocol and Selected Payment Instrument **2732**. The payment manager **2730** also accepts input from the payment applet or MIME message from the merchant as shown at function block **2780**. One aspect of the payment processing is a Consumer Payments Class Library (CPCL) **2770** which encapsulates the payment protocols into a single API. By encapsulating the payment protocols, applications are insulated from protocol variations. A SET Protocol provides an implementation of the client-side component of the Secure Electronic Transaction (SET) Protocol. A complete implementation of the client-side component of the CyberCash micro-payment protocol is also provided.

The Wallet Manager **2722** provides a standard interface to the wallet. It defines the wallet database structures and the payment instrument data structures, controls the access to the wallet and provides concurrency checking if more than one application attempts to open the same wallet. The interface to the wallet manager **2722** is published to allow OEMs to interface with the wallet manager and access the wallet database.

The wallet manager consists of the following subcomponents:

Wallet Access. This component provides an interface to read and write wallet information.

Transaction Manager. This component provides an interface to read and write transaction corresponding to a wallet into the wallet database.

Payment Instrument Manager. This component manager provides a common interface to the specific payment instrument access components.

Credit Card Access, Debit Card Access, Check Access. These components deal with a specific payment instrument.

A Data Manager provides storage and retrieval of generic data items and database records. It is assumed that data fields, index fields or entire data records can be marked as encrypted and the encryption process is largely automated. The data manager has no specific knowledge of database records appropriate to different payment methods. This layer is separated out so as to reduce changes required when new payment methods are introduced. However RSA key pairs and certificates might be considered as "simple" data types. This component also provides an abstraction which supports wallet files on computer disk or contained in smart cards.

The Open Data Base Connectivity (ODBC)/Java Data Base Connectivity (JDBC) component provides Data Base Connectivity where formal database components are required. An embodiment of the Smart Card Wallet allows wallet data to be stored and/or secured by a cryptographic token.

A preferred embodiment includes a single file or directory of files comprising a "wallet" which contains personal information and information about multiple payment methods with the preferred implementation. These payment methods (Visa cards, debit cards, smart cards, micropayments etc.) also contain information such as account numbers, certificates, key pairs, expiration dates etc. The wallet is envisaged to also contain all the receipts and transaction records pertaining to every payment made using the wallet. A Cryptographic API component provides a standard interface for RSA and related cryptographic software or hardware. This support includes encryption, signature, and key generation. Choice of key exchange algorithm, symmetric encryption algorithm, and signature algorithm should all be configurable. A base class stipulates generic behavior, derived classes handle various semantic options (e.g. software based cryptography versus hardware based cryptography.)

The Cryptographic Software portion provides RSA and DES support. This may be provided utilizing the SUN, RSA or Microsoft system components depending on the implementation selected for a particular customer. Cryptographic Hardware creates a lower level API which can underpin the Cryptography API and be utilized to replace Cryptography Software with an off the shelf cryptography engine. The message sequence charts describe the flow of messages/data between the consumer, the browser and/or the various major components of the Semeru system. The major components of the system are the Merchant system which includes the VPOS, the PayWindow, and the Payment Gateway. The merchant system allows a consumer to shop, accept the payment transactions sent by the PayWindow application, and send payment transactions to the acquiring bank. The Consumer Payments Class Library (CPCL) module is a layer within the application which sends the payment transactions, securely, from the consumer to the merchant.

FIG. **28** is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention. The diagram presents the flow of messages between the consumer, the browser, the merchant system, the PayWindow application, and CPCL. This message flow describes the payment process from the time an order is completed and the consumer elects to pay, to the time the payment is approved and the receipt is returned to the consumer. The difference between the Native implementation and Java implementation of the PayWindow application is in the delivery of the order information to the PayWindow. Once the order information is received by the PayWindow, the flow of messages/data is the same for both implementations. In the case of the Native implementation, the order information is delivered via a MIME message. This MIME message is sent to the PayWindow by the browser via a document file. In the Java implementation, the order information is delivered to the PayWindow by an applet. The merchant system sends an applet with the order information to the browser which in turn delivers the order to the PayWindow. Once the order is received, the PayWindow interacts with the consumer and the Protocol modules for the completion of the payment process.

Enters Order and Clicks Calculate Order **2820**

This message represents the consumer order entry and the clicking of the 'Calculate Order' button. The consumer's shopping experience is all condensed into this one message flow for the purpose of highlighting the payment process.

The actual implementation of the shopping process varies, however, the purpose does not, which is the creation of the order.

Order **2830**

This message represents the order information which is sent by the browser to the merchant via an HTML form.

Payment Applet with GSO, PPPs, AIs, Merchant Certificate and URL **2840**

On receipt of the order, the merchant system calculates the payment amount. This message represents the HTML page which is sent by the merchant system detailing the payment amount along with the Java payment applet which contains the GSO, PPPs, AIs, merchant certificate and URL.

Run Payment Applet **2845**

The Java enabled browser runs the Payment applet. The applet displays a button called "Pay" for the consumer to click. This is embedded in the HTML page delivered by the merchant.

Clicks Pay **2850**

This message represents the clicking of the Pay button on the browser by the consumer after confirming the payment amount.

GSO, PPPs, AIs, Merchant Certificate and URL **2860**

This message represents the GSO, PPPs, AIs, merchant certificate and the merchant URL carried by the Java applet. The Java applet now delivers these to the PayWindow application.

Merchant Certificate **2862**

This message represents the merchant's certificate which is sent to the CPCL module for checking the validity of the merchant.

Merchant's Validity **2864**

The CPCL modules examines the merchant's certificate and send this message to the PayWindow indicating whether or not the merchant is a valid merchant.

Wallet, Payment Instruments **2866**

This message represents the wallets and payment instruments that are displayed to the consumer. Not all payment instruments from a wallet are shown to the consumer. Only the ones accepted by the merchant are shown.

Payment Instrument **2868**

This message represents the payment instrument selected by the consumer. This message is created in the current design when the user double clicks on the payment image in the "Select Payment Method" Window.

GSO **2870**

This indicates that the GSO is displayed to the consumer in the "Make Payment Authorization" screen.

Authorization of Payment **2872**

This message represents the authorization of the payment by the consumer. The consumer authorizes the payment by clicking the 'Accept' button on the "Payment Authorization" screen.

Decide Payment Protocol **2874**

Once the consumer authorizes the payment, the payment protocol is decided by PayWindow based on the merchant's Payment Protocol Preferences and the consumer selected payment instrument.

Payment Authorization **2875**

These messages represent the merchant's URL, the GSO, payment protocol (PP) to use, account number, certificate and the private key handle (PK) associated with the payment instrument which is sent to the protocol module.

GSO with Payment Authorization **2876**

This message represents the payment instructions which is sent by the protocol module to the Merchant system. The GSO, PI, consumer certificate and PK is packaged based on the payment protocol.

Signed Receipt **2878**

This message represents the digitally signed transaction receipt received by the protocol module from the merchant.

Save Receipt with Hash Value **2880**

The digitally signed transaction receipt is saved by the PayWindow for future reference.

Payment Successful **2882**

This indicates that the transaction receipt and the 'payment successful' have been displayed to the consumer.

Certificate Processing

A payment instrument must be certified by a "certificate issuing authority" before it can be used on a computer network. In the case of credit card payments, the issuer may be one of the card issuing banks, but it might also be a merchant (eg SEARS), a transaction acquiring bank or an association such as VISA or Mastercard.

Payment instrument information is stored in the consumer's wallet. The certificate which authorizes the payment instrument will be stored along with that data in a secured database. The process of acquiring a certificate is described below. A certificate can be delivered to a consumer in a preconfigured wallet. The consumer receives a wallet which contains the certificate together with the necessary details associated with a payment instrument including a payment instrument bitmap which is authorized by a certificate issuing authority or the agencies represented by the issuing authority.

Obtaining a Certificate

A consumer will deliver or cause to be delivered information to a certificate issuing authority. FIG. **29** is an illustration of a certificate issuance form in accordance with a preferred embodiment. A user may fill out the form on-line, on paper and mail it in, or get his bank or credit card company to deliver it. The consumer delivered data will usually contain a public key belonging to a security key pair generated by consumer software. This information will normally be mailed to the consumer's address and actuated by a telephone call from the consumer. The certificate authority takes this information and uses it to validate that he is indeed entitled to use the payment method. This processing normally takes a few days to accomplish. Information will normally be exchanged with the organization issuing the payment method in the physical space if there is one, and with credit agencies. The certificate information is loaded into the consumer's software to enable payment processing to proceed online.

In some cases the consumer will be able to select details about a payment instrument holder (wallet) he desires to own. This may be the icon representing a holder, the access password or other information. After creating the certificate, the issuing authority can use information received in the certificate application to create a custom payment instrument holder ready to use. This payment instrument holder will contain the following information. Payment instrument information including card number **2900** and expiration date **2902**. Personal information including name **2904**, address **2906**, social security number **2908** and date of birth **2910**.

The associated certificate (eg X509 standard), an associated public key or in some cases public/private key pair (eg RSA), and an approved bitmap representing the payment instrument are provided to the requesting consumer. FIG. **30** illustrates a certificate issuance response in accordance with a preferred embodiment. An approved bitmap for a VISA card is shown at **3000**. Also a default payment holder **3010**

and a default payment holder name are provided with the certificate issuance. After the consumer aquires the payment instrument holder **3010**, the payment instrument holder is immediately visible to him in his collection of payment instrument holders. FIG. **31** illustrates a collection of payment instrument holders in accordance with a preferred embodiment. The predefined payment instrument holder **3100** is the same JOHN's WALLET that was predefined based on defaults by the certificate issuance form. FIG. **32** illustrates the default payment instrument bitmap **3200** associated with the predefined payment instrument holder **3210** resulting from the consumer filling in and obtaining approval for a VISA card.

FIG. **33** illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment. Next time the payment instrument holder is opened in a payment context the certificate issuing authority's approved instrument bitmap can be used to select the payment instrument and utilize it to make purchases. FIG. **34** illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention.

FIG. **35** is a flowchart of conditional authorization of payment in accordance with a preferred embodiment. Processing commences at **3500** where the program initializes the connection between the cardholder and the merchant for the purposes of shopping. After the cardholder completes shopping, a new SSL connection is established which provides authenticating information to the merchant. At this point the merchant is able to execute payment functionality (based on SSL or SET) conditionally, based upon the quality and character of the digital signature and the certificate used to validate said signature. Then, at function block **3510**, the cardholder selects the payment instrument for the particular transaction. Payment instruments could include VISA, MASTERCARD, AMERICAN EXPRESS, CHECK, SMARTCARD or DEBIT CARDS. The payment method is then submitted to the merchant at function block **3520**. The merchant then initializes the SET connection to the acquiring bank at function block **3530** if the connection is not already established. Then, at function block **3540**, the certificate is submitted to the merchant from the acquiring bank. The certificate includes a public key portion and a private key used as an irrebutable digital signature to authenticate the parties to the transaction. The certificate also includes information on the level of credit risk which allows a merchant to conditionally decide on the authorization or rejection of credit under a particular payment instrument based on their risk level and the merchant's personal comfort level with the ability of the cardholder to pay. This processing has not previously been possible because the information returned from the authorizing bank did not include a level of credit risk a cardholder posed, it only contained credit rejected or approved.

A detailed description of the gateway internals is presented below in accordance with a preferred embodiment.

Gw_ClearSetRequestHandler

FIG. **51** depicts a flow diagram for the GatewayClearSetRequestHandler routine. Execution begins in Step **5105**. In Step **5110** an SET analysis routine is called to analyze the SET request, as will be more fully disclosed below. Step **5110** sets a status flag indicating the next stage to be performed by the Gateway. In Step **5120** the Gateway checks to see whether the status is set to indicate that a response should be provided to the user. If so, execution proceeds to Step **5190**, which ends the request handling routine and returns control to a calling routine, which then provides a response to the user. Otherwise execution proceeds to Step **5130**. In Step **5130**, the Gateway checks to see if the status is set to indicate that forward translation is required. Forward translation is necessary to translate an outgoing message into a format that can be understood by the host computer. If forward translation is indicated, execution proceeds to Step **5135**. In Step **5135**, the outgoing message is forwarded translated, as more fully disclosed below with respect to FIG. **53**. If no forward translation is indicated, for example, if an already-translated transaction is being retried, execution proceeds to Step **5140**. In Step **5140**, the Gateway checks to see if the next step is communication to the host. If so, the Gateway proceeds to Step **5145**, and initiates host communication as will be more fully discussed below with respect to FIG. **54**. If not, execution proceeds to Step **5150**. In Step **5150**, the Gateway checks to see whether reverse translation is indicated. Reverse translation translates a response from a host into a format useable by the calling routine. If reverse translation is indicated, execution proceeds to Step **5155**, and the reverse translation is performed, as will be more fully discussed below with respect to FIG. **55**. In any case, after either forward translation in Step **5135**, host communication in Step **5145**, or reverse translation in Step **5155**, control returns to Step **5120** for further processing. As will be more fully disclosed below, the forward translation, host communication, and reverse translation routines manipulate status indicators to prevent the occurrence of an infinite loop.

The Gw_ClearSetRequestHandler routine as depicted in FIG. **51** may be implemented using the following C++ code:

```
int Gw_ClearSetRequestHandler(CPCLRequest*pRequest)
{
gwAction          action;
char              fatalError;
CPCLCCRequest     *pVehicle = (CPCLCCRequest *) pRequest;
CGW_Engine        *setTrans = (CGW_Engine*)pVehicle->GetContext();
action = setTrans->AnalyzeSetRequest(pvehicle,&fatalError);
while ((action!=GW_PROCEED_TO_RESPOND)&&(!fatalError)){
    switch (action){
    case GW_PROCEED_TO_FWD_XLAT:
    action = setTrans->TranslateForward(pVehicle);
    break;
case GW_PROCEED_WITH_HOST_COMMS:
    action = setTrans->DoHostCommunication(pVehicle);
    break;
case GW_PROCEED_TO_REV_XLAT:
    action = setTrans->TranslateReverse(pVehicle);
    break;
case GW_PROCEED_TO_RESPOND:
default:
    break;
 }
}
// Response should be built, return up the protocol
// stack so that it will encode and then crypt our response.
    if (fatalError){
    // Set an error code for the protocol stack.
    pVehicle->SetError(eInvalidRequest);
    return(0);
}
else{
    return(1);
 }
}
```

AnalyzeSetRequest

FIGS. **52A** and **52B** describe the AnalyzeSetRequest routine. This routine is by Step **5110** as illustrated in FIG. **51**. Execution begins in Step **5200**. In Step **5205** the various fields in the SET record are obtained, as will be more fully disclosed below with respect to FIGS. **56A** and **56B**. In Step

5210 the Gateway checks the retry count. A retry count is zero indicates that the request being analyzed is a new request, and control proceeds to Step 5212, indicating a new request. If the retry account is non-zero, this means that the request is a retry of a prior request, and control proceeds to Step 5214 where a retry is indicated.

Following either step 5212 or 5214, execution proceeds to Step 5215. In Step 5215 the Gateway checks to see whether the request represents a "stale request," as will be more fully described below with respect to FIG. 57. In Step 5220, the Gateway tests the result of the stale check from Step 5215. If the request is stale it is marked as stale in Step 5222. Otherwise the record is marked as not stale in Step 5224. Following either Step 5222 or Step 5224, control proceeds to Step 5230. In Step 5230 a message representing the SET request is inserted into the database for tracking purposes, and control proceeds to Step 5240.

In Step 5240 the Gateway checks to see if the request had been marked stale in Step 5222. If so, it proceeds to Step 5242, exiting with an error condition. In Step 5245, the Gateway attempts to retrieve from the database a message corresponding to the current SET request, as will be fully disclosed below with respect to FIG. 59. Step 5260 checks to see whether the message was successfully retrieved from the database. If the message was not found in the database, this indicates that the SET request represents a new message, and control proceeds to Step 5270. In Step 5270 a new message representing the SET request is added to the database, as is more fully disclosed below with respect to FIG. 60. Because this is a new request, it must be processed from the beginning, including forward translation. Therefore, after the new message is added in Step 5270, control proceeds to Step 5275. In step 5275, where a status flag is set indicating that the next step to be performed for this message is for translation. If the message was found in Step 5260, this indicates that the request represents a request that is already in progress. Therefore, control proceeds to Step 5280 to update the database with current information representing the request status. The update process is described in further detail with respect to FIG. 61, below. Following Step 5280, control proceeds to Step 5282. In Step 5282 the Gateway checks to see the disposition in which the SET request was left as a result of partial processing. This is done, for example, by interrogating fields in the database record that indicate the steps that have already been performed for this request. In Step 5283, based upon this status information, the Gateway indicates the next stage of processing to be performed: either forward translation, reverse translation, or communication with the host. After this status has been set, whether for a new request in Step 5275, or for an already-existing request in Step 5283, control proceeds to Step 5290, which exits the AnalyzeSetRequest routine, returning control to Step 5110 in FIG. 51.

The AnalyzeSetRequest routine as depicted in FIGS. 52A and 52B may be implemented using the following C++ code:

```
gwAction CGW_Engine::AnalyzeSetRequest(CPCLCCRequest*pVehicle, char
*fatalError)
{
        gwAction        action;
        gwDBRC          dbrc;
        gwRC            rc;
        int             retryCount;
        char            staleMsgFlag;
        *fatalError=_FALSE;   // Default to "all is OK".
        // Extract the key SET fields that are required. The key
        // SET fields contain the primary key elements of the "setmsg"
        // table.
        if ((rc=GetSetKeyFields(pVehicle))!= GW_SUCCESS) {
            switch(rc){
            case GW_NOT_SUPPORTED:
                BuildSetErrorResponse(pVehicle,ISO_RESP_FUNC_NOT_SUPP);
                break;
            default:
                BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
                break;
            }
            *fatalError=_TRUE;      // Only place we return this!
            return (GW_PROCEED_TO_RESPOND);
        }
        else {
            // Set this so that the front-end will be able to tell
            // whether enough information was derived from the request
            // in order to do update the "setmsg" log.
            m_haveKeyFields = 1;
        }
        // If the count of SET messages with current xid and rrpidbase is
        // non-zero then the message is an honest retry otherwise it
        // is a new request.
        if ( (dbrc=Gwdb_GetSetMsgRetryCount(&retryCount))== GWDB_SUCCESS) {
            if (retryCount == 0)
                m_setRequestClass= GW_SREQCL_NEW_REQUEST;
            else
                m_setRequestClass= GW_SREQCL_HONEST_RETRY;
        }
        else {
            BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
            GW_LogError(LOG_ERR, "Gwdb_GetSetMsgRetryCount( ): %d", dbrc);
            return (GW_PROCEED_TO_RESPOND);
        }
```

-continued

```
// Check whether the message is stale. If it is, we still
// insert it into the database shortly but we will not process
// it.
Gwdb_IsSetMsgStale(&staleMsgFlag);
if (staleMsgFlag==_TRUE)
    m_setRequestDisposition= GW_SREQDI_STALE;
else
    m_setRequestDisposition= GW_SREQDI_OK; // Not stale.
// Log the "SET message" in the database. If the insert fails
// then we must have a replay attack!
dbrc = Gwdb_InsertSetMsg( );
switch (dbrc) {
 case GWDB_SUCCESS:
    break;
 case GWDB_DUPLICATE_ON_INSERT:
    BuildSetErrorResponse(pVehicle,ISO_RESP_SECURITY_VIOLATION);
    dbrc = Gwdb_InsertReplayAttack( );
    if (dbrc != GWDB_SUCCESS) {
        GW_LogError(LOG_ERR, "Gwdb_InsertReplayAttack( ): %d", dbrc);
    }
    return (GW_PROCEED_TO_RESPOND);
    break;
default:
    BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
    GW_LogError(LOG_ERR, "Gwdb_InsertSetMsg( ): %d", dbrc);
    return (GW_PROCEED_TO_RESPOND);
    break;
}
// If the message is stale do no more.
if (m_setRequestDisposition== GW_SREQDI_STALE) {
    BuildSetErrorResponse(pVehicle,ISO_RESP_SECURITY_VIOLATION);
    return (GW_PROCEED_TO_RESPOND);
}
// If we reach this far in this function then:
//          i) the request is new or an honest retry AND
//         ii) the request is not stale AND
//        iii) a setmsg record has been added for this request.
// If there is already a "host message" then update the key
// with the new retry count. If there was not a "host message"
// then insert one.
dbrc = Gwdb_GetHostMsg( );
switch(dbrc) {
 case GWDB_SUCCESS:
    dbrc = Gwdb_UpdateHostMsgKeys( );
    break;
 case GWDB_ROW_NOT_FOUND:
    dbrc = Gwdb_InsertHostMsg( );
    if (dbrc != GWDB_SUCCESS) {
        BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
    }
    return(GW_PROCEED_TO_FWD_XLAT);
    break;
default:
    BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
    GW_LogError(LOG_ERR, "Gwdb_GetHostMsg( ): %d", dbrc);
    return (GW_PROCEED_TO_RESPOND);
    break;
}
if(dbrc != GWDB_SUCCESS) {
    BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
    GW_LogError(LOG_ERR, "Gwdb_UpdateHostMsgKeys( ): %d", dbrc);
    return (GW_PROCEED_TO_RESPOND);
}
// If this request is an honest retry then determine if we
// can "short circuit" a) the forward translation, b) the
// communications to the host or c) the reverse translation
// all of which will save time.
if (m_setRequestClass== GW_SREQCL_HONEST_RETRY){
    switch (m_hostResponseDisposition){
   case GW_HRESDI_UNKNOWN:
        action = GW_PROCEED_TO_FWD_XLAT;
        break;
  case GW_HRESDI_RECEIVED_OK:
        action = GW_PROCEED_TO_REV_XLAT;
        break;
  case GW_HRESDI_REV_XLAT_FAILED:
        action = GW_PROCEED_TO_REV_XLAT;
        break;
  case GW_HRESDI_RECEIVE_FAILED:
  case GW_HRESDI_TIMEOUT:
```

-continued

```
            action = GW_PROCEED_WITH_HOST_COMMS;
            break;
        default:
            break;
    }
  }
  return (action);
}
```

TranslateForward

FIG. **53** depicts the execution of the TranslateForward routine, which is called by Step **5135** in FIG. **51**. Execution begins at Step **5310**. In Step **5320**, the Gateway forward-translates the request to prepare it for transmission to the host. Forward translation consists of packaging the fields in the request into a format that is understandable by the legacy system at the financial institution. The exact format of the translated request will vary from institution to institution. However, in general, the format will consist of a fixed length record with predetermined fields, using a standard character set such as ASCII or EBCDIC. In Step **5330**, the Gateway checks to see whether the translation was successfully performed. If not control proceeds to Step **5340**, which returns an error condition. If the translation was successful, control proceeds to Step **5350**. In Step **5350**, the Gateway sets a status flag to indicate that the next stage to be performed for this SET request is to proceed to host communication. This will be used in the next iteration of the Gw_ClearSetRequestHandler routine as depicted in FIG. **51**. After the status is set in Step **5350**, the translate forward routine returns control in Step **5360**.

The TranslateForward routine as depicted in FIG. **51** may be implemented using the following C++ code:

```
gwAction CGW_Engine::TranslateForward(CPCLCCRequest*pVehicle)
{
    gwRC        rc;
    gwDBRC      dbrc;
rc = HM_TranslateForward(m_hostSpecificMessagepVehicle);
if (rc == GW_SUCCESS){
    return (GW_PROCEED_WITH_HOST_COMMS);
}
m_hostRequestDisposition= GW_HREQDI_FWD_XLAT_FAILED;
BuildSetErrorResponse(pVehicle,ISO_RESP_FORMAT_ERR);
dbrc = Gwdb_UpdateHostMsgRequestDisp();
if (dbrc != GWDB_SUCCESS){
GW_LogError
(LOG_ERR, "Gwdb_UpdateHostMsgRequestDisp(): %d",
dbrc);
    }
    return (GW_PROCEED_TO_RESPOND);
}
```

DoHostCommunication

FIG. **54** depicts the step of host communication, as shown in Step **5145** in FIG. **51**. Execution begins in Step **5400**. In Step **5405** the Gateway obtains from the request object the string representing the request text. In Step **5410** it obtains the sequence number for the request. In Step **5415** the Gateway determines the current time, in order to record the time at which the request is made. In Step **5420** the Gateway sends the request to the host and waits for a response from the host. When a response is received, execution continues in Step **5425**. In Step **5425**, the Gateway again checks the current time, thereby determining the time at which a response was received. In Step **5430**, the Gateway checks to see whether the communication was successfully performed. If a communication was not successful, the Gateway records that an error occurred in Step **5432**. If the communication was successful, the Gateway, in Step **5435**, indicates that the request was successfully sent and responded to. In Step **5437**, the Gateway sets the response string based upon the response received in Step **5420**. In Step **5439** the Gateway sets a status to indicate that reverse translation of the received response is required. Regardless of whether the communication was successful or unsuccessful, execution continues to Step **5450**. In Step **5450**, the database is updated with status information from the host communication. In Step **5490**, control is returned to the calling routine.

The DoHostCommunication routine as depicted in FIG. **54** may be implemented using the following C++ code:

```
gwAction CGW_Engine::
DoHostCommunication(CPCLCCRequest*pVehicle)
{
gwHMRC      hmrc;
gwDBRC      dbrc;
gwAction    action = GW_PROCEED_TO_RESPOND;
unsigned char  hostRequestMessage[HOSTREQ_SZ+1];
int         hostRequestLength= 0;
unsigned char  hostResponseMessage[HOSTREQ_SZ+1];
int         hostResponseLength= 0;
long        sequenceNo;
HM_GetRequestString(m_hostSpecificMessage,
&hostRequestMessage[0],
&hostRequestLength);
HM_GetSequenceNo(m_hostSpecificMessage,&sequenceNo);
time(&m_hostRequestTime);
hmrc = SendToHostAndWait(
    &hostRequestMessage[0],hostRequestLength,
    &hostResponseMessage[0],&hostResponseLength);
time(&m_hostResponseTime);
switch(hmrc){
case GWHM_SUCCESS:
    m_hostRequestDisposition= GW_HREQDI_SENT_OK;
    m_hostResponseDisposition= GW_HRESDI_RECEIVED_OK;
HM_SetResponseString(m_hostSpecificMessage,
&hostResponseMessage[0],
hostResponseLength);
    action = GW_PROCEED_TO_REV_XLAT;
    break;
case GWHM_SEND_FAILED:
    m_hostRequestDisposition= GW_HREQDI-SEND_FAILED;
    m_hostResponseDisposition= GW_HRESDI_UNKNOWN;
    break;
case GWHM_RCV_FAILED:
    m_hostRequestDisposition= GW_HREQDI_SENT_OK;
    m_hostResponseDisposition= GW_HRESDI_RECEIVE_FAILED;
    break;
case GWHM_RCV_TIMEOUT:
    m_hostRequestDisposition= GW_HREQDI_SENT_OK;
    m_hostResponseDisposition= GW_HRESDI_TIMEOUT;
    break;
default:
    break;
}
if (hmrc != GWHM_SUCCESS) {
    BuildSetErrorResponse(pVehicle,ISO_RESP_ISSUER_INOP);
}
dbrc = Gwdb_UpdateHostMsAllInfo(sequenceNo,
    &hostRequestMessage[0],hostRequestLength,
    &hostResponseMessage[0],hostResponseLength);
```

-continued

```
if (dbrc != GWDB_SUCCESS){
    BuildSetErrorResponse(pVehicle,ISO_RESP_SYS_MALFUNC);
    GW_LogError
    (LOG_ERR "Gwdb_UpdateHostMsAllInfo(): %d", dbrc);
 }
 return (action);
}
```

TranslateReverse

FIG. **55** depicts the operation of the TranslateReverse routine, as executed in Step **5155** in FIG. **51**. Execution begins at Step **5500**. In Step **5510** the Gateway reverse-translates the response received from the legacy system host. Reverse translation consists of extracting data from the data records received from the legacy system, and placing them in objects so that they are useable by the Gateway. In Step **5520**, the Gateway checks to verify that translation was successful. If translation was successful control proceeds to Step **5530**, where a status flag is set indicating a successful translation. If translation was not successful, control proceeds to Step **5540**, in which the Status Flag is set to indicate an unsuccessful translation. Regardless of whether translation was successful or unsuccessful, execution proceeds to Step **5550**. In Step **5550**, a status flag is set to indicate that the next stage for the request is to provide a response from the Gateway. This step is always executed, because, regardless of whether the translation or any other aspect of the transaction was successful, a response indicating either success or failure must be returned by the Gateway. Control then proceeds to Step **5590**, in which the TranslateReverse routine returns control to the calling routine in FIG. **51**. It will be seen that the TranslateForward routine in FIG. **53**, the DoHostCommunication routine depicted in FIG. **54**, and the TranslateReverse routine depicted in FIG. **55**, each alter the status of the request. As a result as the loop depicted in FIG. **51** executes a particular request will proceed through all three stages and finally to exit in Step **5190**.

The TranslateReverse routine as depicted in FIG. **55** may be implemented using the following C++ code:

```
gwAction CGW_Engine::TranslateReverse(CPCLCCRequest*pVehicle)
{
    gwRC        rc;
    gwDBRC      dbrc;
rc = HM_TranslateReverse(m_hostSpecificMessagepVehicle);
if (rc == GW_SUCCESS){
    // Success; we have a normal PDU to send back to VPOS!
    // If there is any problem further to this (eg: PCL/ASN libs)
    // that the frond-end is responsible for calling the method
    // LogSetErrorResponse()on this engine instance.
    m_setResponseClass= GW_SRESCL_APP_NORMAL_PDU;
    m_setResponseDisposition=GW_SRESDI_SENT_OK;
    HM_GetResponseCode
    (m_hostSpecificMessage,m_setResponseCode);
}
else {
    m_hostResponseDisposition=
    GW_HRESDI_REV_XLAT_FAILED;
    BuildSetErrorResponse
    (pVehicle,ISO_RESP_INVALID_RESPONSE);
    dbrc = Gwdb_UpdateHostMsgResponseDisp();
    if (dbrc != GWDB_SUCCESS) {
      GW_LogError(LOG_ERR,
      "Gwdb_UpdateHostMsgResponseDisp():
      %d", dbrc);
    }
}
// Whether there was a translation error or not we need to respond.
return (GW_PROCEED_TO_RESPOND);
}
```

GetSetKeyFields

FIGS. **56A** and **56B** describe the GetSetKeyFields routine. This routine is called by Step **5205** as illustrated in FIG. **52A**. Execution begins in Step **5600**. In Step **5610**, the Gateway interrogates the request object to determine the request type. In Step **5620**, the Gateway determines whether the request type is for authorization only. If the request type is not for authorization only, execution proceeds to Step **5625**. In Step **5625**, the Gateway checks to see whether the request type is for a sale. If the request type is neither for authorization only nor for a sale, execution proceeds to Step **5630**. In Step **5360**, the Gateway indicates that the request type is not a supported request, and proceeds to Step **5635**, where it returns to the caller.

If the request type is either for authorization only or for a sale, execution proceeds with Step **5640**. In step **5640**, the Gateway initializes a container object to represent the request. In Step **5650**, the Gateway extracts the transaction identifier (XID) for the transaction. In Step **5652**, the Gateway extracts the merchant identifier (MID) for the transaction. In Step **5654**, the Gateway extracts the request/response pair ID (RRPID) and the terminal identifier (TID) for the request. In Step **5656**, the Gateway extracts the retry count associated with the current request. In Step **5660**, a message data area is initialized with the extracted contents. The message area can then be used for further processing by the called routine. In Step **5690**, the GetSetKeyFields routine returns control to the caller.

The GetSetKeyFields as depicted in FIGS. **56A** and **56B** may be implemented using the following C++ code:

```
gwRC CGW_Engine::GetSetKeyFields(CPCLCCRequest*pVehicle)
{
        gwRC            transRc = GW_SUCCESS;
        unsigned int    got;
        char            s_RrpidTid[2*XID_SZ];
        unsigned long   rrpid;
        unsigned long   tidOffset;
          m_setKeyFields.reqType= pVehicle->GetRequestType( );
          switch(m_setKeyFields.reqType){
          case CPCLRequest::CCAuthOnly:
          case CPCLRequest::CCSale:
            {
            // Initial cast to correct subclass.
            CASNAuthorizationRequestDataContainer*s_req =
              ((CPCLCCAuthOnlyRequest*)pVehicle)->GetRequestContainer( )-
```

-continued

```
>get_data( )->get_data( );
//xid
                s_req->get_transaction_id( )->get_x_id( )->
                get_value((unsigned char *) &m_setKeyFields.xid,XID_SZ, &got);
// mid
#ifdefJUNE_3RD
                strncpy(m_setKeyFields.mid,"42581", MID_SZ);
#else
                // TODO: get code from Deepak for pulling MID out of s_req!
                strncpy(m_setKeyFields.mid,"42581", MID_SZ);
                //bah!
#endif
//-----------------------------------------------------------
            // NOTE: We have agreed with VPOS team that the RRPID field
            //       will contain the following:
            //
            //       <rrpid> <space> <tid> <null>
            //
            //   where <rrpid> is a string representing the rrpid value
            //   and <tid> is a string representing the tid value.
            //
            //-----------------------------------------------------------
                memset(s_RrpidTid,'\0', sizeof(s_RrpidTid));
                s_req->get_AuthorizationRequestData_extensions( )->
                  get_auth_req_res_pair_id( )->
                  get_value((unsigned char *) &s_RrpidTid, sizeof(s_RrpidTid), &got);
                // get rrpid and offset to the tid.
            sscanf(s_RrpidTid, "%d %n", &rrpid, &tidOffset);
                // rrpidBase and retryCount
                m_setKeyFields.retryCount= rrpid % 100;
                m_setKeyFields.rrpidBase= rrpid - m_setKeyFields.retryCount;
                // tid
            strncpy(m_setKeyFields.tid,(s_RrpidTid+tidOffset),TID_SZ);
                // reqDate
                GW_GetTimeFromASNTime(&(m_setKeyFields.merchantTime),
                      s_req->get_authorization_request_data( ));
                break;
                }
            case CPCLRequest::CCAuthReversal:          // == Void
            case CPCLRequest::CCCreditReversal:
            case CPCLRequest::CCCapture:
            case CPCLRequest::CCCredit:          // == Refund | Return
            case CPCLRequest::CCCaptureReversal: // == Void
            // case eBalInquiry:
            transRc = GW_NOT_SUPPORTED;
                break;
            default:
                transRc = GW_NOT_SUPPORTED;
                break;
            }
            // Initialize the host message will with the key fields "in the clear"!
             if (m_hostSpecificMessage== NULL) {
                transRc = GW_FAILED;
            }
            else {
                HM_Initialize(m_hostSpecificMessage,&m_setKeyFields);
            }
            return (transRc);
}
```

Gwdb_IsSetMsgStale

FIG. **57** depicts the Gwdb_IsSetMsgStale routine. This routine is called by Step **5215** as illustrated in FIG. **52**A. Execution begins in Step **5700**. In Step **5710**, the Gateway checks to see whether this is the first time the Gwdb_IsSetMsgStale has been called for this request. If this is the first time, Steps **5715** through **5730** are performed; otherwise those steps are skipped. In Step **5715**, a field representing the message life is initialized to a predetermined duration. The message life is a field that will be used to determine how long the message representing the transaction will remain valid. The use of the message life field prevents a transaction that is effectively lost due to extensive processing delays from being processed. In Step **5720**, the Gateway checks to see if the value of the message life is equal to zero. If the message life is equal to zero, a default value, i.e., 300 seconds or 5 minutes, is assigned to the message life in Step **5725**. In Step **5730**, an indicator for this request is set to indicate that first time processing has already been performed for this request. This flag is the same flag interrogated in Step **5710**, and is used to prevent successive reinitialization of the message life field.

In Step **5740**, the Gateway checks to see whether the merchant's time stamp, plus the value of the message life, is less than the time of the request. If so, then the request is considered stale, and is marked stale in Step **5750**. If not, the request is not stale, and is marked not stale in Step **5755**. Following either of Step **5750** or **5755**, the Gwdb_IsSetMsgStale exits in Step **5790**. The Gwdb_IsSetMsgStale routine as depicted in FIG. **57** may be implemented using the following C++ code:

```
void CGW_Engine::Gwdb_IsSetMsgStale(char*staleFlag)
{
    static char gotStaleDuration=0;
    static long setMsgLife;
    static char *funcName = "Gwdb_IsSetMsgStale";
    // Only get this once per process lifetime.
    if (gotStaleDuration==0){
      FILE *fp;
      char duration[INI_MAXLNSZ+1];
    if ((fp=OpenIniFile())!=NULL){
        setMsgLife = 0;
        (void)iniGetParameter
        (fp, "GATEWAYADMIN", "SetMsgLife",
duration);
        setMsgLife = atol(duration); // could return 0; handled later.
        (void) CloseIniFile(fp);
      }
    if (setMsgLife == 0){
        setMsgLife = 5 * 60; // Default to 5 minutes;
    }
    gotStaleDuration = 1;
      }
    // If the message has expired its lifetime.
      if ((m_setKeyFields.merchantTime+
      setMsgLife)<m_setRequestTime)
      *staleFlag = _TRUE; // request is stale.
      else
      *staleFlag = _FALSE; // honour request, it is not stale.
return;
}
```

Gwdb_InsertSetMsg

FIG. **58** depicts the Gwdb_InsertSetMsg routine. This routine is called from Step **5230** as illustrated in FIG. **52A**. Execution begins in **5800**. In Step **5810**, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step **5820**, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step **5830**, a database commit function is performed, thereby instructing the database engine to commit the database changes to a permanent recording, i.e., by writing the information to the file, and/or by journalizing the change made by INSERT function. In Step **5890**, the routine returns control to the calling program.

The Gwdb_InsertSetMsg as depicted in FIG. **58** may be implemented using the following C++ code:

```
gwDBRC CGW_Engine::Gwdb InsertSetMsg()
{
EXEC SQL BEGIN DECLARE SECTION;
// Key.
char *h_xid             = &(m_setKeyFields.xid[0]);
long h_rrpidBase        = m_setKeyFields.rrpidBase;
int h_retryCount        = m_setKeyFields.retryCount;
// Columns to insert into.
char *h_mid             = &(m_setKeyFields.mid[0]);
char *h_tid             = &(m_setKeyFields.tid[0]);
char h_merchantTime[26];
int h_requestType = (int) m_setKeyFields.reqType;
char h_requestTime[26];
int h_requestClass = (int) m_setRequestClass;
int h_requestDisposition = (int) m_setRequestDisposition;
char h_responseTime[26];
int h_responseClass = (int) m_setRequestClass;
int h_responseDisposition = (int) m_setResponseDisposition;
char *h_responseCode = m_setResponseCode;
EXEC SQL END DECLARE SECTION;
static char *funcName = "Gwdb_InsertSetMsg";
    gwDBRC dbrc;
GW_MakeDateString(h_merchantTime,
&(m_setKeyFields.merchantTime));
    GW_MakeDateString(h_requestTime,&m_setRequestTime);
    GW_MakeDateString(h_responseTime,&m_setResponseTime);
EXEC SQL INSERT INTO setmsg
    (
      xid, rrpidbase, retrycount, mid,tid,
      merchanttime,
      requesttype,
      requesttime,
      requestclass, requestdisposition,
      responsetime,
      responseclass, responsedisposition, responsecode
    )
    VALUES
    (
      :h_xid,:h_rrpidBase,:h_retryCount,:h_mid,*h_tid,
      TO_DATE(:h_merchantTime,
      'DY MON DD HH24:MI:SS YYYY'),
      :h_requestType,
      TO_DATE(:h_requestTime,
      'DY MON DD HH24:MI:SS YYYY'),
      :h_requestClass,:h_requestDisposition,
      TO_DATE(:h_responsTime,
      'DY MON DD HH24:MI:SS YYYY'),
      :h_responseClass,:h_responseDisposition,:h_responseCode
    );
    dbrc = Db_Error(funcName);
(void) Db_Commit(funcName);
return (dbrc);
}
```

Gwdb_GetHostMsg

FIG. **59** depicts the Gwdb_GetHostMsg routine. This routine is called by Step **5245** as shown in FIG. **52B**. Execution begins in Step **5900**. In Step **5910**, the routine invokes a database select function by, for example, executing an SQL SELECT command. In Step **5920**, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step **5930**, the Gateway checks to see whether the database retrieve operation was successfully performed. If so, execution proceeds to Step **5935**. In Step **5935**, the Gateway sets a number of status variables from the values retrieved from the database records. This includes the time the request was made, the time a response was received, the contents of the request string, the contents of the response string, and a sequence number for this request. In Step **5940**, a commit operation is performed. In Step **5900**, control returns to the calling program.

The Gwdb_GetHostMsg as depicted in FIG. **59** may be implemented using the following C++ code:

```
gwDBRC CGW_Engine::Gwdb_GetHostMsg()
{
    struct tm requestTimeTM;
    struct tm responseTimeTM;
EXEC SQL BEGIN DECLARE SECTION;
    // Key.
    char *h_xid = &(m_setKeyFields.xid[0]);
    long h_rrpidBase = m_setKeyFields.rrpidBase;
// Indicator Variables.
    short h_RequestStringInd;
    short h_ResponseStringInd;
// Columns to retreive.
    long h_sequenceNo = 0;
    int     *h_reqYear = &requestTimeTM.tm_year;
    int     *h_reqMonth = &requestTimeTM.tm_mon;
    int     *h_reqDay = &requestTimeTM.tm_mday;
    int     *h_reqHour = &requestTimeTM.tm_hour;
    int     *h_reqMinute = &requestTimeTM.tm_min;
    int     *h_reqSecond = &requestTimeTM.tm_sec;
    int     *h_requestDisposition = (int *) &m_hostRequestDisposition;
    VARCHAR h_requestString[128];
    int     *h_resYear = &responseTimeTM.tm_year;
    int     *h_resMonth = &responseTimeTM.tm_mon;
    int     *h_resDay = &responseTimeTM.tm_mday;
    int     *h_resHour = &responsTimeTM.tm_hour;
```

-continued

```
    int     *h_resMinute = &responseTimeTM.tm_min;
    int     *h_resSecond = &responseTimeTM.tm_sec;
    int     *h_responseDisposition =
            (int *) &m_hostResponseDisposition;
    VARCHAR h_responseString[128];
EXEC SQL END DECLARE SECTION;
    static char *funcName = "Gwdb_GetHostMsg";
    gwDBRC dbrc;
    // Set the "tm" structures to null. Set tm_isdst to -1 so that the
    // mktime() function will determine if whether
    Daylight Savings Time
    // is active.
    memset(&requestTimeTM,'\0',sizeof(tm));
    requestTimeTM.tm_isdst=-1;
    memset(&responseTimeTM,'\0',sizeof(tm));
    responseTimeTM.tm_isdst=-1;
EXEC SQL SELECT
    sequenceno,
    TO_NUMBER( TO_CHAR(requesttime, 'YYYY'))-1900,
    // see "man
    mktime"
    TO_NUMBER(TO_CHAR(requesttime,'MM'))-1,
    // see "man
    mktime"
    TO_NUMBER(TO_CHAR(requesttime,'DD')),
    TO_NUMBER(TO_CHAR(requesttime,'HH24')),
    TO_NUMBER(TO CHAR(requesttime,'MI')),
    TO_NUMBER(TO_CHAR(requesttime,'SS')),
    requestdisposition,requeststring,
    TO_NUMBER(TO_CHAR(responsetime,'YYYY'))-1900,
    // see "man mktime"
    TO_NUMBER(TO_CHAR(responsetime,'MM'))-1,
    // see "man mktime"
    TO_NUMBER(TO_CHAR(responsetime,'DD')),
    TO_NUMBER(TO_CHAR(responsetime,'HH24')),
    TO_NUMBER(TO_CHAR(responsetime,'MI')),
    TO_NUMBER(TO_CHAR(responsetime,'SS')),;
responsedisposition,responsestring
INTO
:h_sequenceNo,
:h_reqYear,:h_reqMonth,:h_reqDay,
:h_reqHour,:h_reqMinute,:h_reqSecond,
:h_requestDisposition,:h_requestString:h_requestStringInd,
:h_resYear,:h_resMonth,:h_resDay,
:h_resHour,:h_resMinute,:h_resSecond,
:h_responseDisposition,:h_responseString:h_responseStringInd
    FROM
      hostmsg
    WHERE
      xid = :h_xid AND
      rrpidbase = :h_rrpidBase;
dbrc = Db_Error(funcName);
if (dbrc == GWDB_SUCCESS){
if(h_requestStringInd == -1) h_requestString.len=0;
if(h_responseStringInd == -1) h_responseString.len=0;
m_hostRequestTime = mktime(&requestTimeTM);
m_hostResponseTime = mkTime(&responseTimeTM);
    HM_SetRequestString(m_hostSpecificMessage,
      h_requestString.arr,
      h_responseString.len);
HM_SetResponseString(m_hostSpecificMessage,
      h_responseString.arr,
      h_responseString.len);
HM_SetSequenceNo(m_hostSpecificMessage,h_sequenceNo);
}
(void Db_Commit(funcName);
return(dbrc);
}
```

Gwdb_InsertHostMsg

FIG. **60** depicts the Gwdb_InsertHostMsg routine. This routine is called by Step **5270** as illustrated in FIG. **52**B. Execution begins in Step **6000**. In Step **6010**, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step **6020**, the database return code is obtained in order to be used as a return code from the Gwbd_InsertSetMsg routine. In Step **6040**, a commit operation is performed. In Step **6090**, the routine returns control to the calling program.

The Gwdb_InsertHostMsg as depicted in FIG. **60** may be implemented using the following C++ code:

```
gwDBRC CGW_Engine::Gwdb_InsertHostMsg()
{
EXEC SQL BEGIN DECLARE SECTION;
    // Key.
    char *h_xid = &(m_setKeyFields.xid[0]);
    long h_rrpidBase = m_setKeyFields.rrpidBase;
    int h_retryCount = m_setKeyFields.retryCount;
// Columns to insert into.
    long h_sequenceNo = 0;
    char h_requestTime[26];
    int h_requestDisposition = (int) m_hostRequestDisposition;
    char h_responseTime[26];
    int h_responseDisposition = (int) m_hostRequestDisposition;
EXEC SQL END DECLARE SECTION;
    static char *funcName = "Gwdb_InsertHostMsg";
    gwDBRC dbrc;
    GW_MakeDateString(h_requestTime,&m_hostRequestTime);
    GW_MakeDateString(h_responseTime,&m_hostResponseTime);
EXEC SQL INSERT INTO hostmsg
(
    xid, rrpidbase,retrycount
    sequenceno,
    requesttime,
    requestdisposition,
    responsetime,
    responsedisposition
)
VALUES
(
    :h_xid,:h_rrpidBase,:h_retryCount,
    :h_sequenceNo,
    TO_DATE(:h_requestTime,'DY MON DD HH24:MI:SS YYYY'),
    :h_requestDisposition,
    TO_DATE(:h_responseTime,'DY MON DD H24:MI:SS YYYY'),
    :h_responseDisposition
);
dbrc = Db_Error(funcName);
(void) Db_Commit(funcName);
return (dbrc);
}
```

Gwdb_UpdateSetMsgResponseInfo

FIG. **61** depicts a flow diagram for the Gwdb_UpdateSetMsgResponseInfo routine. Execution begins at Step **6100**. In Step **6110**, the routine invokes a database update function by, for example, executing an SQL UPDATE command. In Step **6120**, the database return code is obtained in order to be used as a return code from the Gwbd_UpdateSetMsgResponseInfo routine. In Step **6190**, the routine returns control to the calling program.

The Gwdb_UpdateSetMsgResponseInfo as depicted in FIG. **61** may be implemented using the following C++ code:

```
gwDBRC CGW_Engine::Gwdb_UpdateSetMsgResponseInfo()
{
EXEC SQL BEGIN DECLARE SECTION;
    // Key.
    char *h_xid = &(m_setKeyFields.xid[0]);
    long h_rrpidBase = m_setKeyFields.rrpidBase;
    int h_retryCount = m_setKeyFields.retryCount;
    // Columns to update.
    char h_responseTime[26];
    int h_responseClass = (int) m_setResponseClass;
    int h_responseDisposition = (int) m_setResponseDisposition;
    char *h_responseCode = m_setResponseCode;
EXEC SQL END DECLARE SECTION;
    static char *funcName = "Gwdb_UpdateSetMsgResponseInfo";
    gwDBRC dbrc;
    GW_MakeDateString(h_responseTime,&m_setResponseTime);
    EXEC SQL UPDATE setmsg SET
    responsetime = TO_DATE
    (:h_responseTime,'DY MON DD HH24:MI:SS YYYY'),
```

-continued

```
    responseclass = :h_responseClass,
    responsedisposition = :h_responseDisposition,
    responsecode = :h_responseCode
WHERE
    xid = :h_xid AND
    rrpidbase = :h_rrpidBase AND
    retrycount = :h_retryCount;
dbrc = Db_Error(funcName);
(void) Db_Commit(funcName);
return(dbrc);
}
```

FIG. **62** is the main administration display for the Gateway in accordance with a preferred embodiment. A set of menu selections are presented at **6200** which will be described in more detail for each display. FIG. **63** is a configuration panel in accordance with a preferred embodiment. The configuration panel provides access to management information for configuring a gateway management information database. The Merchant Identifier (Mid) **6310** is a thirty character, alphanumeric field that uniquely defines a merchant. The Merchant Name **6320** is a fifty character, alphanumeric field, the Edit **6330** and Delete field **6340** are hyperlinks to detailed panels for modifying information in the management information database. FIG. **64** is a host communication display for facilitating communication between the gateway and the acquirer payment host. The IP Address Field **6410** contains the Internet Protocol address for communicating via TCP/IP to the Internet. The TCP logical port field **6430** uniquely identifies the port for accessing the Internet, and the SAVE field **6430** invokes storing of the host communication information in the database. FIG. **65** is a Services display in accordance with a preferred embodiment. This display initiates portions of the Gateway such as the host mulitplixer **2130** of FIG. **21**. FIG. **66** is a graphical representation of the gateway transaction database in accordance with a preferred embodiment. Each of the fields represents a portion of the internet database schema in accordance with a preferred embodiment.

Gateway System Administration

As described above, the gateway is a secure computer system that mediates Internet based payment transactions between merchant servers and the acquiring bank's card processing host. The gateway supports secure communications between merchants using the Internet and acquirers using private financial networks and maintains appropriate logs of all transactions.

FIG. **67** illustrates the gateway hardware architecture in accordance with a preferred embodiment. Internet **6730** based merchants communicate transaction information via merchant servers **6700** running the VPOS software described earlier to a gateway **6740**. The gateway **6740** performs all conversion necessary to route transaction requests through the bank network **6750** to the host processor **6760**. Results from the host legacy system **6760** are routed back through the bank network **6750** to the gateway **6740** which transfers the information through the Internet **6730** to the merchant system **6700**.

FIG. **68** is a block diagram setting forth the gateway software architecture in accordance with a preferred embodiment. The gateway **6870** includes an SSL-compliant HTTP server **6800** that ensures transport-level security of HTTP communication between the gateway **6870** and the acquirer's data operations center. The VPOS transmits SET requests utilizing HTTP and public key certificates are used to facilitate authentication of merchant and gateway identity. The HTTP server **6800** facilitates the communication between the gateway **6870** and the VPOS terminals over the Internet utilizing HTTP. The VPOS terminals are configured to communicate with the gateway utilizing the gateway IP address and port number. The HTTP server **6800** also supports HTML pages for gateway system administration, and utilizes Netscape's Enterprise Server 2.0 to support URL access to the port number. The administrative information contained on the gateway can be accessed by any commercial browser if the user has appropriate authority to access the gateway.

The gateway web adaptor **6820** is a Common Gateway Interface (CGI) program that is invoked by the HTTP Server **6800** when a request arrives from a VPOS terminal. The web adaptor **6820** extracts the contents of a posted transaction and passes it to the SET library **6850** which decrypts the SET request into a plain text SET object utilizing the cryptographic library **6810**. The SET library **6850** then calls the gateway engine **6870** to convert the plaintext SET object into a host specific request message utilizing the host message converter **6860**. When a response is received, it is passed to the SET library **6850** for encryption utilizing the cryptographic library **6810**. The encrypted SET response is sent back to the VPOS terminal. An error is logged if an invalid HTTP request is detected, if the library cannot decrypt the SET response, or if the library cannot encrypt the SET response. Stale messages are rejected.

For credit card transactions, the gateway **6870** supports Secure Electronic Transaction (SET) requests providing for message encryption, authentication and encapsulation. The SET library **6850**, converts SET requests into messages that are processed by the Host Message Converter. The SET Cryptographic library **6810** performs the following functions. 1) Converts an encrypted byte stream from an HTTP message sent by a POST method from a VPOS terminal to a plaintext SET object representing the request; and 2) converts a plaintext SET object representing the response into an encrypted byte stream which is transmitted back to the originating VPOS terminal. The SET library **6850** uses the cryptographic library for all standards based security operations. The cryptographic library also provides an interface to the cryptographic hardware.

The host message converter **6860** converts messages to bank-specific formats and routes messages to the appropriate host processor. The converter **6860** also converts messages from the host processor to the format used by the SET library **6850**. The multi-threaded gateway engine **6870** utilizes SET decryption and encryption and the host message converter **6860** to support simultaneous SET requests from multiple VPOS terminals. The gateway also determines whether a plaintext SET request is an original request, an honest retry attempt, or a replay attack. The possible results include for an honest retry, possibly because an earlier response did not reach the VPOS, the gateway looks up the response from the database and returns it. If it is a replay attack, an error is logged. If it is an original request, then the VPOS engine proceeds to convert it to a host-specific request message. Then, it sends the request out to the remote host via the gateway host multiplexer **6890** and waits for a response. The gateway also logs all intermediate processing states, request messages and response messages, and groups all protocol-specific processing actions in a module with common API functions. The gateway also converts host responses to plaintext SET response objects, logs an error if the forward conversion fails, logs an error if the host multiplexer **6890** cannot send the request, logs an error if the gateway times out the response and logs an error if the reverse conversion fails.

The gateway host multiplexer **6890** communicates with the host based on the host's IO address and port number. If the host does not support TCP/IP, a link-level protocol converter must be installed. The gateway host multiplexer also sends multiple request messages to the host, serializes them, and receives messages asynchronously from the host and matches each of them with the corresponding request message which allows a particular gateway process to stop waiting and proceed with the reverse conversion.

The gateway **6870** stores all transaction information in a relational database **6845** controlled by a database server **6840** and specifically designed for high transaction volume. The database also records the details and state of every transaction processed by the gateway and generates transaction reports utilizing the gateway administrative interface. The sequence generator **6880** supplies the gateway with unique sequence numbers utilized in host request messages for identification of each transaction. An optional host simulator resides on the gateway server and transparently simulates a host for testing purposes. The gateway host communication configuration screen can utilize the IP address and port address of the host simulator to simulate a host processor that receives host requests and supplies host responses for testing purposes, and returns an authorization approval response message appropriately formatted. During normal transaction processing the host simulator is disabled and the gateway communication configuration screen contains the IP address and port number of the host processor.

The gateway includes a set of tools for administering gateway, database, operating system and Web server software. Also, the database schemas and the gateway administrative interface allows system administrators to create custom database reports to remotely monitor gateway performance. A gateway merchants display is provided to manage the merchant's information on a gateway. Merchants can be added, deleted or modified using a display. The gateway also incorporates a system variable reflective of the maximum length of time to allow for a transaction request to reach the gateway from the VPOS terminal. If the stale message time limit is exceeded, then the transaction request is rejected and the merchant must resend the transaction. All of the gateway tools are accessible from commercial browsers assuming the user requesting the access has appropriate authorization.

The gateway provides a secure server that mediates transactions between merchant's VPOS (Virtual Point-Of-Sale) servers and a financial institution's host processor. The gateway supports secure communications between merchants using the Internet on one side, and the host processor using legacy secure financial networks on the other side. Between the two interfaces, the gateway maintains a detailed log of all transactions, whether completed or in-progress. The gateway can handle multiple requests simultaneously and is designed to be easily scaled to handle a high transaction load.

The gateway accepts transactions from merchants over the Internet and converts them to a host-specific format before forwarding them to a host processor belonging to an existing financial network. Responses from the host, after the reverse conversions, are returned to the originating merchants over the Internet. Transactions between VPOS and the gateway are made secure by utilizing the SET protocol for all communication.

GATEWAY CORE ENGINE COMPONENTS

This document details a software interface between the gateway core engine software component and the host message specific software that implements the host specific financial message formatting and conversion functions.

The gateway performs the following functions:

1. Receives encrypted payment requests from merchants, as HTTP POST messages via the Internet.

2. Unwraps and decrypts the requests.

3. Authenticates digital signatures of the requests based on certificates.

4. Supports transaction types and card types as required by a financial institution.

5. Accepts concurrent VPOS transactions from each of the merchant servers.

6. Converts transaction data to host-specific formats and forwards the mapped requests (in the clear) to the host processor using the existing financial network.

7. Receives transaction responses from the host.

8. Converts the responses from host-specific formats and correlate the mapped responses with the original requests.

9. Encrypts the responses, encapsulates them in HTTP reply messages, and sends them back to the originating merchants over the Internet.

10. Provides transaction logging in a relational database, symbolic transaction tracing, performance reporting, and other system administration functions.

The Host Message interface is the interface between the gateway core engine and the host specific functions that implement steps **6** through **8** in the above list. There may be more than one Host Message implementation but only one vGATE core software implementation.

Host Message Interface

Purpose

The Host Message interface grew from the desire to separate the core functions of the gateway software from those functions that are host specific. There are a variety, currently over 1,400 understood by VeriFone equipment and software, of legacy financial networks and protocols that exist worldwide. We expect to have great demand for our VPOS and gateway payment solutions and must be in a position to quickly develop and deploy our Internet payment solutions for the top Banks and acquirers. The Host Message interface (HM interface) will be used by the various software development organizations of VeriFone to develop software that will enable the gateway product to be deployed with existing financial networks without changing the interface point to the financial network. Gateway, along with VPOS allows the acquirers to offer Internet Payment solutions to their Merchant base without changing their current financial networks.

The VPOS software, although it too can be customized and branded for a particular acquirer, is not as tightly coupled with the financial network as is gateway. The protocol between the VPOS and gateway that is currently used is SET and this protocol, in principle, isolates the VPOS software from the legacy network that it is ultimately connected to (via gateway).

Overview

The host specific portion of gateway are accessed by the gateway core engine by calling the functions contained in the Host Message implementation. The software that implements the host message interface is linked to the gateway core engine software either statically or dynamically (shared

object libraries in UNIX or DLLs on Windows NT). The Host Message API is defined in this document.

The software that implements the host message interface must be re-entrant. The gateway engine will call the host message interface from either a process or a thread. The gateway engine is designed to be multi-threaded and will be capable of handling multiple requests simultaneously.

The host message interface is a "C" based API. The implementation of the host specific library must be implemented in "C++" as some of the data that is needed is contained in "C++" objects and is only accessible using the methods for those objects. The host specific software need only use very basic features of "C++" and need not be completely designed and or programmed using object-oriented techniques.

Transaction Types

There are currently seven transaction types, or payment request types, that can arrive at gateway from VPOS. Each of these request types has an associated request object and response object. There are methods that are made public for each of these request objects that allow the host specific module to "get" the data from the incoming request in order to build the host specific request. There are also public "methods" for the response object allowing the host specific functions to "set" the response data that will be communicated by the gateway engine back to VPOS.

VGATE API

FIG. **69** illustrates the gateway components and interfaces in accordance with a preferred embodiment. The gateway API specifies the expected behaviors and information exchange for transaction processing functions, transaction data structures, SET access functions, certificate management functions, string utility functions and system configuration parameters. The architecture includes three distinct sections to enhance distribution of the functions. The upper API **6910** consists of concise functions which are available via a call out interface to custom modules **6901–6903** provided by application developers. The lower API **6940** allows the gateway **6930** and the custom modules **6901–6903** to call in to reusable helper functions **6950–6970** which facilitate isolation from possible future fluctuations in structural definitions of SET data elements. The system configuration custom parameters **6920** include the more static information elements required for such things as the network address of the host or its proxy equipment, timeout values, expected length of certain messages and other system configuration information. These parameters are specified as name-value pairs in the gateway system initialization file.

The vGATE SET Access API shields application developers from the structural complexities of the SET (Secure Electronic Transaction) protocol by providing high-level access functions to SET-defined data elements and allowing the use of such functions to be integrated seamlessly with the translations of a particular acquirer-specific message format. The need for the SET Access API is twofold: first, program abstraction and, second, separation of concerns. The forest of deeply nested data structures generated from compiling the textual SET ASN. 1 definitions is very tedious to traverse, and direct exposition to multiple levels of pointer manipulation is a major distraction in developing acquirer-driven custom applications for vGATE. Furthermore, the SET proposed standard, still in draft form, has been and is expected to be going through various revisions in which the ASN. 1 definitions are changed significantly. Any code that is involved in directly accessing the container structures will have to be rewritten.

The above two software-engineering considerations are serious enough to warrant a solution using abstract representations and access methods. The vGATE SET Access API provides the application developers with a set of predefined classes for each of the SET messages with simple access methods to get data from, and set values to, the different elements of the SET protocol data units. The present content of the API is a current implementation of the PCL (Payment Class Library) **6950**. In using the SET Access API, vGATE application developers will be able to insulate their code from all future fluctuations in SET structural definitions. For example, extensions to SET are segregated from the standard SET functions utilizing an extend SET PCL **6960**.

The system is partitioned to separate design concerns at different levels and to allow for graceful adaptations by external modules. The language was selected for the API by recognizing, classifying, distilling and exposing the programmatic activities that are typically required for translating legacy payment protocols and in communicating with host processors.

Within a generic framework of reusable, prefabricated components (the core gateway), points of access have been defined to allow customization activities to occur (gateway API). The resulting architecture allows a software developer to focus on custom applications by freeing them from the underlying operational details already handled by the gateway core engine.

The gateway core handles basic transaction management (control flow, logging, error detection and recovery), internal interprocess communication, relational database access, communication with vPOS terminals over the Internet, interfacing with a host processor via a legacy network, and overall system administration. Whereas the gateway controls the processing of payment messages, it has no embedded knowledge of any acquirer-specific payment protocols.

The custom applications for a particular acquirer can be developed in C or C++ and linked to the gateway core software either statically or dynamically. If they are dynamically linked, then they are considered "shared objects" on Unix or "dynamic link libraries" on Windows NT. A gateway installation consists of the core gateway engine and the custom modules designed for a particular acquirer.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for processing an encrypted payment transaction utilizing a structured gateway between a network application and a host processor, comprising the steps of:

(a) receiving the encrypted payment transaction at the gateway from the network application;

(b) decrypting the encrypted payment transaction into a decrypted transaction utilizing a first application program interface to access one or more helper functions;

(c) converting the decrypted transaction into a converted transaction utilizing a second application program interface to access one or more custom modules;

(d) storing one or more data elements associated with the decrypted transaction; and

(e) transmitting the converted transaction to the host processor.

2. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more helper functions include support for one or more payment protocols.

3. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more helper functions include support for a secure electronic transaction protocol.

4. A method for processing an encrypted payment transaction, as recited in claim 3, wherein the one or more helper functions include extensions to the secure electronic transaction protocol.

5. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more custom modules perform host specific message formatting.

6. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more custom modules utilize the gateway to perform external communication.

7. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more custom modules modify the control flow of the gateway.

8. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the gateway is customized utilizing at least one system configuration parameter.

9. A method for processing an encrypted transaction, as recited in claim 1, further comprising the step of authenticating the encrypted payment transaction.

10. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more custom modules direct recovery actions performed by the gateway.

11. A method for processing an encrypted payment transaction, as recited in claim 1, wherein the one or more custom modules perform functions that are internal to the gateway.

12. A system for processing an encrypted payment transaction utilizing a structured gateway between a network application and a host processor, comprising:

(a) means for receiving the encrypted payment transaction at the gateway from the network application;

(b) means for decrypting the encrypted payment transaction into a decrypted transaction utilizing a first application program interface to access one or more helper functions;

(c) means for converting the decrypted transaction into a converted transaciton utilizing a second application program interface to access one or more custom modules;

(d) means for storing one or more data elements associated with the decrypted transaction; and

(e) means for transmitting the converted transaction to the host processor.

13. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more helper functions include support for one or more payment protocols.

14. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more helper functions include support for a secure electronic transaction protocol.

15. A system for processing an encrypted payment transaction, as recited in claim 14, wherein the one or more helper functions include extensions to the secure electronic transaction protocol.

16. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more custom modules direct recovery actions performed by the gateway.

17. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more custom modules utilize the gateway to perform external communication.

18. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more custom modules control the gateway processing by specific messages which are passed from the custom modules through the gateway to a specific target.

19. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the gateway is customized utilizing at least one system configuration parameter.

20. A system for processing an encrypted transaction, as recited in claim 12, further comprising means for authenticating the encrypted payment transaction.

21. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more custom modules perform host specific message formatting.

22. A system for processing an encrypted payment transaction, as recited in claim 12, wherein the one or more custom modules perform functions that are internal to the gateway.

23. A computer program embodied on a computer-readable medium for processing an encrypted payment transaction utilizing a structured gateway between a network application and a host processor, comprising:

(a) a code segment for receiving the encrypted payment transaction at the gateway from the network application;

(b) a code segment for decrypting the encrypted payment transaction into a decrypted transaction utilizing a first application program interface to access one or more helper functions;

(c) a code segment for converting the decrypted transaction into a converted transaction utilizing a second application program interface to access one or more custom modules;

(d) a code segment for storing one or more data elements associated with the decrypted transaction;

(e) a code segment for transmitting the converted transaction to the host processor.

24. A computer program, as recited in claim 23, wherein the one or more helper functions include support for one or more payment protocols.

25. A computer program, as recited in claim 23, wherein the one or more helper functions include support for a secure electronic transaction protocol.

26. A computer program, as recited in claim 25, wherein the one or more helper functions include extensions to the secure electronic transaction protocol.

27. A computer program, as recited in claim 23, wherein the one or more custom modules perform functions that are internal to the gateway.

28. A computer program, as recited in claim 23, wherein the one or more custom modules utilize the gateway to perform external communication.

29. A computer program, as recited in claim 23, wherein the one or more custom modules control the gateway processing by specifying messages which are passed from the custom modules through the gateway to a specific target.

30. A computer program, as recited in claim 23, wherein the gateway is customized utilizing at least one system configuration parameter.

31. A computer program, as recited in claim 23, further comprising a code segment for authenticating the encrypted payment transaction.

32. A computer program, as recited in claim 23, wherein the one or more custom modules perform host specific message formatting.

33. A computer program, as recited in claim 23, wherein the one or more custom modules direct recovery actions performed by the gateway.

34. A computer program, as recited in claim 23, wherein the gateway is customized utilizing at least one system configuration parameter.

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